

Trawl Survey of Shrimp and Forage Fish Abundance in Alaska's Westward Region, 2004

by

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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Weights and measures (metric)		General		Measures (fisheries)	
centimeter	cm	Alaska Administrative		fork length	FL
deciliter	dL	Code	AAC	mid-eye-to-fork	MEF
gram	g	all commonly accepted		mid-eye-to-tail-fork	METF
hectare	ha	abbreviations	e.g., Mr., Mrs., AM, PM, etc.	standard length	SL
kilogram	kg			total length	TL
kilometer	km	all commonly accepted			
liter	L	professional titles	e.g., Dr., Ph.D., R.N., etc.	Mathematics, statistics	
meter	m			<i>all standard mathematical</i>	
milliliter	mL	at	@	<i>signs, symbols and</i>	
millimeter	mm	compass directions:		<i>abbreviations</i>	
		east	E	alternate hypothesis	H _A
		north	N	base of natural logarithm	<i>e</i>
		south	S	catch per unit effort	CPUE
		west	W	coefficient of variation	CV
		copyright	©	common test statistics	(F, t, χ^2 , etc.)
		corporate suffixes:		confidence interval	CI
		Company	Co.	correlation coefficient	
		Corporation	Corp.	(multiple)	R
		Incorporated	Inc.	correlation coefficient	
		Limited	Ltd.	(simple)	r
		District of Columbia	D.C.	covariance	cov
		et alii (and others)	et al.	degree (angular)	°
		et cetera (and so forth)	etc.	degrees of freedom	df
		exempli gratia		expected value	<i>E</i>
		(for example)	e.g.	greater than	>
		Federal Information		greater than or equal to	≥
		Code	FIC	harvest per unit effort	HPUE
		id est (that is)	i.e.	less than	<
		latitude or longitude	lat. or long.	less than or equal to	≤
		monetary symbols		logarithm (natural)	ln
		(U.S.)	\$, ¢	logarithm (base 10)	log
		months (tables and		logarithm (specify base)	log ₂ , etc.
		figures): first three		minute (angular)	'
		letters	Jan,...,Dec	not significant	NS
		registered trademark	®	null hypothesis	H ₀
		trademark	™	percent	%
		United States		probability	P
		(adjective)	U.S.	probability of a type I error	
		United States of		(rejection of the null	
		America (noun)	USA	hypothesis when true)	α
		U.S.C.	United States	probability of a type II error	
			Code	(acceptance of the null	
		U.S. state	use two-letter	hypothesis when false)	β
			abbreviations	second (angular)	"
			(e.g., AK, WA)	standard deviation	SD
				standard error	SE
				variance	
				population	Var
				sample	var
Weights and measures (English)					
cubic feet per second	ft ³ /s				
foot	ft				
gallon	gal				
inch	in				
mile	mi				
nautical mile	nmi				
ounce	oz				
pound	lb				
quart	qt				
yard	yd				
Time and temperature					
day	d				
degrees Celsius	°C				
degrees Fahrenheit	°F				
degrees kelvin	K				
hour	h				
minute	min				
second	s				
Physics and chemistry					
all atomic symbols					
alternating current	AC				
ampere	A				
calorie	cal				
direct current	DC				
hertz	Hz				
horsepower	hp				
hydrogen ion activity	pH				
(negative log of)					
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

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**TRAWL SURVEY OF SHRIMP AND FORAGE FISH ABUNDANCE IN
ALASKA'S WESTWARD REGION, 2004**

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ABSTRACT

The Alaska Department of Fish and Game (ADF&G) conducted a small-mesh bottom trawl survey for shrimp and forage fish from September 27 to October 23, 2004 in waters of the Westward Region's Kodiak, Chignik and South Peninsula commercial shrimp fishing districts. The purpose of the survey was to provide pandalid shrimp biomass indices within the Region. Results were compared with established threshold biomass levels, below which no commercial fisheries can occur. Secondary objectives included obtaining species composition data and length frequencies from commercially important groundfish and shrimp, generating density estimates for forage fish, and tagging Pacific cod *Gadus macrocephalus* as part of an ongoing mark-recapture study.

A standard, high-opening, shrimp research trawl net with 3.1-cm stretch mesh throughout the mouth, body, and codend was used to complete 92 tows. Stations were selected in established strata using a random number generator with tows conducted in a station for a standard distance of 1.85 km. The entire catch of each tow was weighed and sorted by species with a subsample examined to determine catch proportions of small animals. Commercially important groundfish, shrimp, and forage fish were sampled for species identification and size characteristics. Population estimates for shrimp were generated using an area swept technique.

No sections in any district produced shrimp population estimates above the department's established minimum acceptable biomass index (MABI), the criteria used as a threshold for opening commercial shrimp fishing. Most sections remain well below historic population levels, but have remained relatively stable in recent surveys.

Catch composition in the 2004 survey was approximately 22% shrimp and 78% fish. The primary shrimp species captured was the northern pink shrimp *Pandalus borealis*. Walleye pollock *Theragra chalcogramma*, flathead sole *Hippoglossus elassodon*, and arrowtooth flounder *Atheresthes stomias* comprised the majority of fish catches. Forage fish were found throughout the survey area with eulachon *Thaleichthys pacificus* and Pacific sandfish *Trichodon trichodon* occurring in greatest volume. Eulachon populations have increased significantly in recent years.

Key words: trawl survey, shrimp, forage fish, abundance, Westward Region, 2004

INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) conducted a small-mesh bottom trawl survey for shrimp and forage fish from September 27 to October 23, 2004. The survey focused on historically productive shrimp grounds in nearshore waters around Kodiak Island, Shelikof Strait, and bays along the south side of the Alaska Peninsula located in the Kodiak, Chignik and South Peninsula shrimp management districts of Westward Registration Area J (Figure 1). Districts are listed in Title 5 of the Alaska Administrative Code Chapter 31 and have been further divided into sections for fishery management purposes (Figure 2).

Shrimp have been commercially harvested around Kodiak Island since 1958 and along the south side of the Alaska Peninsula since 1968. Total landings averaged more than 50 million pounds per year during the 1960s and 1970s, which was primarily taken with trawl gear (Figure 3). Little activity for trawl shrimp has occurred since 1982 as stock abundance and fisheries declined sharply with changing oceanographic conditions (Anderson 2000). Harvest has averaged less than 10,000 pounds per year since 1986 (Jackson and Ruccio 2003). The pink or northern pink shrimp *Pandalus borealis* comprised more than 85% of the catch in the heyday of the fishery, but humpy shrimp *P. goniurus*, coonstriped shrimp *P. hypsinotus*, and sidestriped shrimp *Pandalopsis dispar* all made significant contributions to the harvest (Gaffney 1981). Other shrimps taken incidentally include several species from the families Crangonidae and Hippolytidae. Spot shrimp *P. platyceros* and coonstriped shrimp have occasionally been the target of minor pot fisheries.

ADF&G began research on pandalid shrimp in 1968 with a commercial fishery logbook program. The objectives of this program were to establish baseline data on relative stock abundance and to define basic life history parameters for the primary species involved in the commercial fisheries (Jackson et al. 1983). The trawl survey stock assessment program began in 1970 to provide directly comparable stock abundance indices and monitor recruitment, growth, and the effects of fishing on the population age structure. Successive indices for a given stock were shown to track fluctuations in relative abundance over time (Jackson 1979). A management strategy developed in 1979 utilized survey results as the primary data source for harvest level determination (ADF&G 1982). Harvest levels were based on proportions of abundance index thresholds. The management goal was to achieve maximum harvests without affecting reproductive potential. The strategy was based on trends in stock abundance relative to a representative biomass index (RBI). This level was defined as the mean abundance estimate obtained after initial exploitation, but prior to the abundance decline. It was thought that recovery to this level could reasonably be expected. Based on the RBI, a second level called the minimum acceptable biomass index (MABI) was established at 40% of the RBI level. Stocks for which abundance levels were less than the prescribed MABI were considered severely depressed and no fishing was allowed. The management plan approved by the Alaska Board of Fisheries (BOF) in 1982 detailed RBI and MABI levels for 26 shrimp fishing sections (Table 1).

ADF&G conducted spring and fall stock assessment surveys for shrimp during the years when shrimp abundance was high and commercial fishing effort was at its greatest level. As stocks declined and commercial fishing effort decreased, the level of research conducted by ADF&G also decreased. Trawl assessment surveys of shrimp stocks were first reduced from spring and fall surveys to a single fall survey in 1986. Further funding reductions resulted in a biennial shrimp survey beginning in 1987 and a triennial survey from 1989 to 2001. The scope of areas covered by the shrimp surveys has also declined since the early 1980s as a function of budget constraints. Funding from National Marine Fisheries Service (NMFS) to extend their Pavlof Bay small-mesh trawl data series and monitor long-term changes of the species community structure in the Gulf of Alaska (GOA) was the basis for an additional survey in 2002. The survey series continued in 2003 and 2004 when ADF&G partially funded the program from commercial fishing license sales, while NMFS provided support with a nearshore marine research project grant.

Forage fish populations have come under increased scrutiny by federal and state regulatory bodies. In 1998, the North Pacific Fishery Management Council and in 1999 the BOF, adopted prohibitions on the directed take of forage fish in the North Pacific and Bering Sea. Both groups recognized the importance of forage fish in the transfer of energy from primary to secondary producers in the marine ecosystem as well as being important food for marine mammals and many commercial groundfish species. ADF&G has not conducted forage fish research per se, but catch data from prior shrimp or small-mesh trawl surveys has provided important information on forage fish populations to other agencies and researchers. Changing species composition documented from the long term, regular assessment program has given insight on the effects of changing oceanographic conditions (Anderson et al. 1997a and 1997b, Anderson and Piatt 1999).

OBJECTIVES

The primary objective of the 2004 small-mesh trawl survey was to provide stock abundance indices of shrimp in the historically productive sections of the Kodiak, Chignik and South

Peninsula Districts. Population estimates were compared with established MABIs to determine the potential for commercial fishery openings.

Secondary objectives of the 2004 survey were to:

- Determine species composition of the catch by haul and survey area.
- Obtain length frequency distributions for commercially important shrimp and fish species.
- Obtain composition samples of shrimp for each stratum surveyed and analyze each sample for sex and length frequency.
- Compare relative abundance of shrimp to recent and historic survey data to make inferences about population trends.
- Generate density estimates for forage fish species from the areas trawled.
- Floy-tag¹ Pacific cod *Gadus macrocephalus* captured during the survey as part of an ongoing mark-recapture project to study migration and growth patterns of that species.

METHODS

TRAWL DESCRIPTION AND SURVEY PROCEDURES

The 27.4 m ADF&G research vessel *Resolution* was used to trawl areas of historic commercial exploitation and other areas of known shrimp habitat. A small-mesh trawl with a three bridle, high-opening was used. The gear was initially developed by NMFS and adopted as the standard for shrimp trawl research by NMFS, ADF&G, and Canadian researchers in British Columbia. (Watson 1987). This net has an 18.6 m footrope with a 17.0 m tickler chain suspended by 29 cm dropper chains. Astoria semi-vee trawl doors weighing 340 kg each and measuring 1.7 m x 2.7 m were attached with three 18.2 m dandyines (1.8 cm in diameter) to hold the net open. Flotation was achieved by using twenty-nine 16.6 cm floats. The net was constructed with 3.1 cm stretch mesh through the mouth, body, and codend. Electronic net measurement systems and scuba observations have shown this net opens to an average width of 9.8 m and to a height of 4 m.

Bays to be surveyed were divided into strata based on historic shrimp population densities. In some smaller bays, this division was not utilized. Within the stratum or bay, each survey area was divided into blocks of four stations with a station encompassing approximately 3.4 km². One station within each block was selected using a random number generator. If the station was determined to be untrawlable, the closest adjacent station within the four-station block with trawlable bottom was selected. The trawl net was towed at a speed of 3.7 km/h and for a distance of 1.85 km. Several stations were not trawled for the full 1.85 km due to untrawlable ocean bottom. Total distance towed was recorded by Differential Global Position System (DGPS) readings.

Total catch from each trawl haul was weighed to the nearest two-kilogram increment by lifting the codend with a crane scale. The entire haul was sampled for commercially important species including: sablefish *Anoplopoma fimbria*, Pacific cod, walleye pollock *Theragra chalcogramma*, Pacific halibut *Hippoglossus stenolepis*, all rockfish species *Sebastes* and *Sebastolobus*, lingcod

¹ Use of trade names does not constitute an endorsement by ADF&G.

Ophiodon elongatus, giant Pacific octopus *Octopus dofleini*, all salmon species *Oncorhynchus* sp., all sharks in the families Lamnidae and Squalidae, all skates in the family Rajidae, Dungeness crabs *Cancer magister*, king crabs *Paralithodes* sp. and *Lithodes* sp., Tanner crabs *Chionoecetes* sp., and Pacific herring *Clupea pallasii*. In many instances, adult and juvenile animals were sampled differently (e.g., adult walleye pollock were whole-haul sampled, while juvenile pollock were subsampled). In addition, giant wrymouth *Cryptacanthodes giganteus* and large pieces of debris were whole-haul sampled because these items were not likely to be taken in a subsample split.

A 1.5 m² splitting net with a 3.1-cm mesh liner was used to obtain a subsample of the total catch. The splitting net was tied into the sorting bin before the haul was dumped from the codend. The splitting net was then lifted up though the catch by hydraulic crane and the subsample moved to a sorting table for further assessment (i.e., table subsample). The entire table subsample and animals that were whole-haul sampled were then identified to species, enumerated, and weighed to the nearest kilogram. A second subsample of shrimp (i.e., shrimp-only subsample) was taken from the initially selected table subsample to determine shrimp species composition. This shrimp-only subsample was weighed to the nearest gram.

All commercially important groundfish species were measured to obtain size frequency distributions. Fish species were measured from snout tip to fork or mid point of the caudal fin. From each trawl station where sufficient shrimp were available, 200 shrimp (typically pink shrimp) were measured from the right eye socket to the midpoint on the posterior margin of the carapace to the nearest 0.5-mm.

A composite sample of shrimp was collected from all hauls within each stratum and frozen at sea. The primary pandalid shrimp in the strata composition samples were sampled in the laboratory and identified to species, measured, weighed, and sexed using techniques described in Butler (1980). Female northern pink shrimp were also classified as primiparous (first spawning season) or multiparous (multiple spawning seasons) based on sternal spine characteristics (McCrary 1971).

SHRIMP POPULATION ESTIMATION

Shrimp population estimates for each stratum from the 2004 trawl survey were derived using an area-swept technique (Alverson and Pereyra 1969). Estimates from each stratum were totaled to provide an abundance index for each section. Some assumptions are undertaken in using the area swept technique. It is assumed that all the shrimp within the trawl path are caught. Also, it is assumed that the total area considered contains all the shrimp habitat within that selected station or strata and that all areas used in the expansion of population levels is shrimp habitat. As these assumptions may not always be the case, the generated population estimate is a relative and not an absolute index. In addition, estimates are for all species of shrimp captured in survey trawls and not just those fished commercially. Spot shrimp or 'prawns' and coonstriped shrimp, are commonly found in steep, rocky substrate, which is not suitable for trawling. Therefore, their population densities are poorly estimated using this technique.

Based on net performance data, it is assumed that the trawl swept a path 9.8-m wide, and the total area swept by the trawl in a one km tow was 1/102 km². All tows were recorded in nautical miles and converted to kilometers (nautical miles x 1.852 = kilometers towed). In instances where tow distance was either less than or greater than 1.85 km, catch data was proportioned accordingly. The catch of shrimp per one kilometer tow was converted into a kg per km² density

estimate by multiplying by a factor of 102, or the number of net widths in a kilometer. The density was then multiplied by the total area (km²) within a stratum that was considered shrimp habitat to generate the population index:

Population index = shrimp kg/km towed x 102 (area swept expanded to one km²) x station or stratum size (km²)

RESULTS

Ninety-two stations were successfully sampled in waters around the Kodiak archipelago and south of the Alaska Peninsula during the 2004 survey (Figure 4). Survey haul parameters such as tow start and end position, date, depth, bottom temperature, and catch were collected for each haul (Appendix A).

Groundfish and various invertebrates accounted for the majority of the total catch by weight. Walleye pollock were 28% of the total weight, followed by shrimp (21.5%), eulachon (11.1%), flathead sole *Hippoglossoides elassodon* (10%) and arrowtooth flounder *Atheresthes stomias* (7.1%) (Table 2). Within the shrimp species, 18.9% of the total weight were northern pink shrimp, 1.3% sidestriped shrimp, and 1.3% humpy shrimp. Coonstriped and other non-commercial shrimp species comprised 0.1% of the survey catch. More than 12,000 length measurements were taken from 27 groundfish species and Pacific halibut (Table 3, Appendix B).

Forage fish were captured throughout the survey area totaling 13.2% of the survey catch by weight. Eulachon were the most abundant occurring in 77% of the trawl hauls and comprising 11.1% of the catch by weight. Pacific sandfish was next most abundant at 1.8% of the sample weight. Other forage fish species caught included longsnout prickleback *Lumpenella longirostris*, rainbow smelt *Osmerus mordax*, and capelin *Mallotus villosus*.

SHRIMP POPULATIONS

Northern pink shrimp were captured in 98% of the survey hauls, averaging 24.3 kg per km towed. The highest density per haul was found in Wide Bay on the Alaska Peninsula in the Kodiak District where seven hauls averaged 141.8 kg per km towed (Figure 5). Northern pink shrimp density was second highest in the Marmot Bay Section where eight hauls averaged 45.8 kg per km towed. Lowest densities occurred in the Beaver Bay and Mitrofanina Island Sections; these were two areas that had supported substantial commercial fisheries decades earlier. Total shrimp abundance estimates between sections followed a similar pattern, but varied somewhat because of habitat considerations. Results from stations on fishing grounds that had been traditionally utilized in the Marmot Island Section of the Kodiak District produced the largest estimated shrimp population at 809 metric tons (mt). Inner Marmot Bay and Chignik Bay yielded estimates near 500 metric tons (Table 4).

A shrimp population estimate of 1,362 mt was generated for southern Shelikof Strait, an area not commercially utilized until after the fishery collapse. The average density of 8.6 kg of shrimp per km towed was only about one-third the entire survey average. However, eighteen exploratory tows produced this comparatively large estimate because they were spread over a large area.

Carapace lengths were recorded from 17,974 northern pink shrimp. The average size for all northern pink shrimp measured onboard was 17.4 mm carapace length (CL) (Figure 6). Average size was largest in Stepovak Bay followed by Unga Strait and Chiginagak Bay (Figure 7). Both Stepovak and Unga were characterized by lower than average shrimp densities and few small

shrimp less than 17 mm CL. Wide Bay, Marmot Bay and Shelikof Strait all had smaller northern pink shrimp with an average size less than 17 mm CL.

Composite samples of northern pink shrimp collected by strata and section were examined in the laboratory for size and sex characteristics of the populations. In addition, non-ovigerous females were examined for the presence of sternal spines as an indicator of the first breeding season for an individual. Sternal spines have been shown to be absent in northern pink shrimp after the first molt into breeding dress. Few ovigerous female or transitional stage shrimp were observed due to the timing of the survey. Most shrimp transitioning from male to female appear to have completed this change by the time of the survey. The ovigerous period was just beginning as a few egg-bearing females appeared in sample hauls from five areas (Figures 8-10). Most surveyed areas exhibited multiple modes of female shrimp indicating several age classes in the population. Unga Strait and Chiginagak Bay have at least four age classes of shrimp present as two modes appear in the multiparous female category. This contrasts with Nakalilok Bay where all of the females appear to be first year spawners. Potential recruitment to the spawning biomass appeared most positive in Shelikof Strait, Wide Bay, Marmot Bay and the Marmot Island Section which all displayed strong modes of 15 mm CL male shrimp. Future near term recruitment to the spawning population appeared especially poor in Chignik Bay, Kuiu Bay and Stepovak Bay as the proportion of male shrimp was relatively low. Females in the Wide Bay composite sample were not differentiated by spawning class; however, that sample was characterized by having no females greater than 22.5 mm CL.

Humpy shrimp were found only in Wide Bay during the 2004 survey (Figure 11). The population abundance was estimated to be 71 mt in 2004, a slight increase from 57 mt in 2003. Mean carapace length of sampled shrimp during the most recent survey was 16.5 mm CL (Figure 12). The sexed composite sample showed only 15% of the females were multiparous (Figure 13).

Sidestriped shrimp were more widespread, occurring in 62% of the trawl hauls (Figure 14). Nearly all samples in the survey coming from deeper than 80 fathoms had sidestriped shrimp present. Shelikof Strait had the greatest concentration as hauls there averaged 136 fathoms. The mean length of sidestriped shrimp measured during the survey cruise was 22 mm. The size mode centered at 18.5 mm CL dominated the population structure (Figure 15). It appeared that at least 5 age classes were present in the population with two distinct modes of males, especially in Shelikof Strait and the Marmot Island Section (Figure 16). The ovigerity period for sidestriped shrimp began earlier than for northern pink shrimp or humpy shrimp as the majority of females were carrying eggs during the survey. A biomass estimate of 732 mt was generated for sidestriped shrimp from all areas surveyed, however 608 mt of that came from the Shelikof Strait (Table 5). This was due to the relatively large area of habitat considered in the Shelikof estimate and the relatively high shrimp density.

FORAGE FISH DISTRIBUTION

Eulachon were the most abundant forage fish, present in 78% of the survey hauls averaging 14.2 kg per km towed from all sample hauls. The highest density and largest catch in a single haul came from Nakalilok Bay. Marmot Bay near Kodiak Island had the next highest average density with numerous bays along the Alaska Peninsula also showing significant numbers of fish (Figure 17). Pacific sandfish were the second most abundant of the forage fishes, but found in only 14% of the hauls. The catch occurred primarily in Wide Bay with a few individuals also captured in Chiniak Bay and Castle Bay (Figure 18). Longsnout pricklebacks, as the next most abundant

forage fish, occurred in 9% of the survey hauls. These fish were found in Wide Bay on the Alaska Peninsula and Marmot Bay on Kodiak Island. Pacific herring, *Clupea pallasii* are not considered a forage fish under the Forage Fish Management Plan (5 AAC 39.212); however, they are an important food source for many species of birds, animals and fish. Herring accounted for 0.16% of the total survey catch weight and occurred in 15% of the hauls.

TAGGED PACIFIC COD

Pacific cod predation contributes significantly to shrimp mortality (Albers and Anderson 1985). ADF&G has been studying cod movements and growth for the past eight years. During the 2004 small-mesh trawl survey, 162 Pacific cod were tagged and released with an orange spaghetti-type Floy-tag at the base of the first dorsal fin. Information from tag returns indicates movement towards spawning aggregations in the spring and dispersal to feed at other times of the year (D. Urban, ADF&G, personal communication).

BOTTOM TEMPERATURES

Water temperature was recorded on each tow during the survey using a thermograph attached to the headrope of the trawl. The coolest ocean floor temperatures were found in Shelikof Strait and Unga Strait. The warmest temperatures were found in Wide Bay along the Alaska Peninsula and Chiniak Bay on Kodiak Island (Figure 19). The average survey bottom temperature was 7.0°C with a range from 5.2°C to 9.9°C.

DISCUSSION

Shrimp populations as a whole were similar in 2004 to the previous two years. Shrimp comprised 21.5% of the total survey catch as compared to 13.2% in 2003 and 15.5% in 2002. Although the shrimp component of the catch increased, fish catches decreased especially flatfish, Pacific cod and walleye pollock (Figure 20). The average density of northern pink shrimp was 24.3 kg per km towed similar to 25.3 kg per km towed in 2003 and 29.9 kg per km towed in 2002 (Figure 21). The average sidestriped shrimp density was 1.7 kg per km towed in 2004. This compares to an average of 2.4 kg per km towed in 2003 and 1.0 kg per km towed in 2002.

The primary objective of the survey was to compare current shrimp population estimates with established MABIs to determine if commercial harvest could be allowed. All historically fished stocks surveyed were below their MABI and considered severely depressed (Table 6). Except for the General Section, no sections will open to commercial shrimp fishing until a survey shows a recovery to the minimum acceptable levels. Wide Bay, part of the Mainland Section, had produced an estimate above the MABI required for a fishery in 2001 and 2002, but fell below MABI in 2003 and stayed below the threshold with the current estimate. Sample hauls from Shelikof Strait generated the largest estimate of shrimp abundance for any area surveyed. As part of the Kodiak District General Section, Shelikof Strait is currently open to commercial shrimp fishing from June 15 to February 28 without a MABI specified. Commercial fishing activity has been minimal and the harvest miniscule compared to the 1,362 mt population estimate.

Shrimp populations in Wide Bay during 2004 were largely unchanged from the prior survey. Drastic reductions had occurred in the previous two years. The 2003 estimate of 384 mt for all shrimps was less than half the previous year's estimate, which was also lower than the prior year. Coonstriped and sidestriped shrimp were still absent after virtually disappearing in 2003 (Figure 22). The size composition of northern pink shrimp also changed with the proportion of large

shrimp reduced by about one-half from 2001. The mean size also continued a downward trend (Figure 23). Wide Bay shrimp populations may have experienced unusually high natural mortality or perhaps a migration of the larger individuals to the Shelikof Strait.

A well documented ecological shift from dominant shellfish to dominant groundfish populations occurred with a warming of Gulf of Alaska waters beginning in the late 1970s. Temperatures in recent years have been cooler but an overall trend has not been clearly established. Temperatures of 3°C to 6°C were found ideal for larval shrimp development in the laboratory (Nunes 1984). Large pink shrimp populations are most commonly found in waters between 0°C and 5°C (Shumway et al. 1985). Ocean bottom temperatures recorded on the 2004 survey were largely warmer than optimum for pandalid shrimp production with only 26% of the hauls exhibiting ocean bottom temperatures of 6°C or lower.

Unfavorable ocean temperatures may not be the most limiting element for shrimp production. Another factor constricting shrimp population growth is the effect of predation in the current environment. Analysis of cod-shrimp interactions in the Atlantic Ocean revealed top-down control in oceanic food webs. Shrimp biomass was strongly inversely related to cod biomass, but not to ocean temperature (Worm and Myers 2003). An example of this may be found in Wide Bay on the south side of the Alaska Peninsula. During the past four surveys this area had both the highest density of shrimp and the warmest ocean bottom temperatures. A large reduction in shrimp biomass occurred between 2001 and 2003, which coincided with an increase in the cod density. Pacific cod were caught at the rate of 5.39 kg per km towed in 2001, were virtually absent in 2002 and then increased to 15.8 kg per km towed in 2003.

Of the forage fishes, eulachon were caught most frequently and in greatest abundance on the survey. They are an important prey item for marine mammals as well as other fish species, however little is known of the eulachon population structure in Alaska. Eulachon are anadromous and spawn in rivers that drain into the Gulf of Alaska. Apparently, conditions have been advantageous for survival in recent years. The catch of eulachon averaged 14.2 kg per km towed in 2004, which was the highest level recorded in the history of the small-mesh trawl survey database (Figure 24). A recruitment event was observed in the size frequency data collected from the past three surveys. A strong size mode appeared at about 8 cm in 2002 and 11 cm in 2003 (Figure 25). This mode appeared again in the 2004 survey at 16 cm and was evident in many sampling locations. Although not part of the sampling protocol, eulachon were often identified by sex. About 95% of the fish captured on the small-mesh survey were males. This finding was surprising to the researchers onboard and will be formally investigated during future surveys.

Walleye pollock has been the leading component by weight of small-mesh survey catches since the mid-1980s. In 2004 adult pollock from sample hauls were encountered at the lowest rate since 1979, approximately half of the two previous surveys (Figure 26). In contrast, the juvenile walleye pollock catch rate has increased slightly each year since 2002. Adult pollock were captured in 98% of hauls with the highest density found in Chiniak Bay on Kodiak Island and Beaver Bay along the Alaska Peninsula (Figure 27). These sites were nearly the extreme east and west ends of the survey area. Juvenile pollock defined as age-0 fish were also captured in 98% of the hauls with the highest concentrations occurring in Wide Bay and Marmot Bay. Fewer young fish were found in the western half of the survey area.

The small-mesh trawl survey has shown considerable increases in the number of spiny dogfish in recent years (Figure 28). Rarely encountered prior to 1998, the small sharks occurred in 54% of the sample hauls and were more prevalent in the eastern portion of the survey area. The highest catches appeared in Marmot Bay (Figure 29).

Jellyfish were found in 80% of the survey hauls averaging 4.7 kg per km towed. These gelatinous zooplankton can occur in dense aggregations and consume high numbers of commercially important fish and crustacean larvae (Purcell and Sturdevant, 2001). *Cyanea* sp. was the leading component of this group at about 60% of the catch. Other species captured included *Aequia* sp., *Aurelia* sp. and *Chrysaora melanaster* (Figure 30).

Perhaps the greatest value of this survey is the continuation of the time series for small-mesh trawl samples. Marine fishery management is moving away from a single species approach based on static oceanographic conditions that do not, in practice, exist. It is now recognized that effective and sustainable use of resources requires more understanding of ecosystem processes and how they are affected by changing environmental and human influences. Foremost in research priorities must be the continuation of systematic studies of the marine ecosystem if the effects of those influences are to be examined. The small-mesh trawl survey series has documented species composition of shrimp and fish in the Gulf of Alaska for over 30 years and will continue to provide important clues for researchers trying to understand the ecology of the North Pacific Ocean.

The next small-mesh trawl survey in the Westward Region is scheduled for September-October 2005. Commercial shrimp fishing sections in the Kodiak District will be the focus of that sampling effort.

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REFERENCES CITED

- Alaska Department of Fish and Game (ADF&G). 1982. Westward Region Shrimp Fishery Management Plan, Revision 1, April 1982. Unpublished manuscript Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K82-10, Kodiak.
- Albers, W.D., and P.J. Anderson. 1985. Diet of the Pacific cod, *Gadus macrocephalus*, and predation on the Northern pink Shrimp, *Pandalus borealis*, in Pavlof Bay, Alaska. Fish. Bull. U.S. 83: 601-610.
- Alverson, D.L., and W.T. Pereyra. 1969. Demersal fish explorations in the northeastern Pacific Ocean—an evaluation of exploratory fishing methods and analytical approaches to stock size and yield forecasts. Jour. Fish. Res. Board of Canada 26: 1985-2001.
- Anderson, P.J. 2000. Pandalid Shrimp as Indicators of Ecosystem Regime Shift. J. Northw. Atl. Fish. Sci., Vol. 27: 1-10.
- Anderson, P.J., J.E. Blackburn, and B.A. Johnson. 1997a. Declines of forage fish species in the Gulf of Alaska, 1972-95, as indicators of regime shift. In: Proceedings of the International Symposium on the Role of Forage Fishes in Marine Ecosystems, November 13-16, 1996, Anchorage, Alaska. B.S. Baxter (ed.) 1997. University of Alaska. Alaska Sea Grant Rep., 97-01.
- Anderson, P.J., J.E. Blackburn, W.R. Bechtol, and J.F. Piatt. 1997b. Synthesis and analysis of Gulf of Alaska small-mesh trawl data, 1953 to 1996, and Gulf of Alaska forage fish ichthyoplankton analysis, 1972 to 1996. Appendix L in: Duffy [ed.] EXXON Valdez Oil Spill restoration project annual report, APEX Project Alaska Predator Ecosystem Experiment in Prince William Sound and the Gulf of Alaska; Restoration project 96163LA-P, annual report.
- Anderson, P.J., and J.F. Piatt. 1999. Community reorganization in the Gulf of Alaska following ocean climate regime shift. Mar. Ecol. Prog. Ser., 189: 117-123.
- Butler, T.H. 1980. Shrimps of the Pacific coast of Canada. Can. Bull. Fish. Aquat. Sci. 202: 280pp.
- Gaffney, F.G. 1981. History of Research and Management of Alaskan Shrimp. In: Proceedings of the International Pandalid Shrimp Symposium, February 13-15, 1979, Kodiak, Alaska. University of Alaska. Alaska Sea Grant Report 81-3.
- Jackson, D.R., and M.P. Ruccio. 2003. Kodiak, Chignik and South Peninsula Shrimp Fisheries and Their Management: A Report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K03-7, Kodiak
- Jackson, P.B. 1979. Kodiak pandalid shrimp investigations. Comp. Rept. 5-42-R. Comm. Fish. Res. and Devel. Act. July 1, 1979-June 10, 1980. 42 pp.
- Jackson, P.B., L.J. Watson, and J.A. McCrary. 1983. The Westward Region Shrimp Fishery and Shrimp Research Program, 1968-1981. Alaska Department of Fish and Game, Division of Commercial Fisheries, Informational Leaflet No. 216, Juneau.
- McCrary, J.A. 1971. Sternal spines as a characteristic for differentiating between females of some Pandalidae. J. Fish. Res. Bd. Canada 28: 99-100.
- Nunes, P. 1984. Reproductive and larval biology of Northern shrimp *Pandalus borealis* Kroyer, in relation to temperature. Ph.D. dissertation, Univ. of Alaska, Fairbanks, Alaska. 194p.
- Purcell, J.E. and M.V. Sturdevant. 2001. Prey selection and dietary overlap among zooplanktivorous jellyfish and juvenile fishes in Prince William Sound, Alaska. Mar. Ecol. Prog. Ser., 210: 67-83.
- Shumway, S.E., H.C. Perkins, D.F. Schick, and A.P. Stickney. 1985. Synopsis of biological data on the pink shrimp, *Pandalus borealis* Krøyer, 1838. NOAA Technical Report NMFS 30, FAO Fisheries Synopsis No. 144. May 1985. 57pp.
- Watson, Leslie. 1987. ADF&G Shrimp Research Shrimp Trawl Survey Manual. Unpublished manuscript. Alaska Department of Fish and Game, Division of Commercial Fisheries, Research Operational Plan, Revised January 1987.
- Worm, B. and R.A. Myers. 2003. Meta-analysis of cod-shrimp interactions reveals top-down control in oceanic food webs. Ecology 84(1): 162-173.

TABLES AND FIGURES

Table 1.-Shrimp biomass indices from the Westward Region Shrimp Fishery Management Plan, 1982.

District	Section	RBI ^a	MABI ^b
Kodiak	Kiliuda Bay	5,989	2,405
	Twoheaded Island	8,258	3,312
	Ugak Bay	4,537	1,815
	Alitak Bay		
	Northern Pink	2,405	962
	All species	4,855	1,962
	Alitak Flats	3,176	1,270
	Marmot Island	28,993	11,615
	Inner Marmot Bay	4,128	1,652
	Chiniak Bay	1,637	658
	Uganik Bay	2,931	1,175
	Uyak Bay	3,621	1,447
	Wide Bay	1,184	476
	Puale Bay	1,352	540
Chignik	Chignik Bay	5,159	2,064
	Kujulik Bay	4,288	1,715
	Mitrofanina Island	5,853	2,341
	Ivanof Bay	6,466	2,586
	Chiginagak Bay	780	313
	Aniakchak Bay	3,267	1,307
	Nakalilok Bay	926	372
	Kuiukta Bay	2,160	862
South Peninsula	Stepovak Bay	26,302	10,526
	Unga Strait	8,530	3,412
	West Nagai	7,473	2,976
	Beaver Bay	4,946	1,978
	Pavlof Bay	20,554	8,221
	Morzhovoi Bay	12,160	4,864

^a Representative Biomass Index (metric tons)^b Minimum Acceptable Biomass Index (metric tons)

Table 2.-Relative abundance by weight of the top 20 species, percentage of shrimp, and percentage of forage fish occurrence in the 2004 Westward Region small-mesh trawl survey.

Rank	Common Name	Scientific Name	Percent of Catch by Weight
1	Walleye pollock	<i>Theragra chalcogramma</i>	28.0 %
2	Northern pink shrimp	<i>Pandalus borealis</i>	18.9 %
3	Eulachon	<i>Thaleichthys pacificus</i>	11.1 %
4	Flathead sole	<i>Hippoglossoides elassodon</i>	10.0 %
5	Arrowtooth flounder	<i>Atheresthes stomias</i>	7.1 %
6	Pacific cod	<i>Gadus macrocephalus</i>	4.1 %
7	Juvenile walleye pollock	<i>Theragra chalcogramma</i>	3.1 %
8	Cyanea jellyfish	<i>Cyanea sp.</i>	2.3 %
9	Spiny dogfish	<i>Squalus acanthias</i>	2.2 %
10	Pacific sleeper shark	<i>Somniosus pacificus</i>	1.9 %
11	Pacific Sandfish	<i>Trichodon trichodon</i>	1.8 %
12	Mud star	<i>Ctenodiscus crispatus</i>	1.4 %
13	Sidestriped shrimp	<i>Pandalopsis dispar</i>	1.3 %
14	Humpy shrimp	<i>Pandalus goniurus</i>	1.3 %
15	Pacific halibut	<i>Hippoglossus stenolepis</i>	0.7 %
16	Aequorea jellyfish	<i>Aequorea sp.</i>	0.7 %
17	Aleutian skate	<i>Bathyraja aleutica</i>	0.6 %
18	Magistrate armhook squid	<i>Berryteuthis magister</i>	0.4 %
19	Aurelia jellyfish	<i>Aurelia sp.</i>	0.3 %
20	Rougheye rockfish	<i>Sebastes aleutianus</i>	0.3 %
All other shrimp species			
	Glass shrimp	<i>Pasiphaea pacifica</i>	0.06 %
	Common crangon	<i>Crangon communis</i>	0.05 %
	Coonstriped shrimp	<i>Pandalus hypsinotus</i>	0.01 %
	Barbed eualid	<i>Eualus barbatulus</i>	<0.01 %
	Arctic argid	<i>Argis dentata</i>	<0.01 %
	Ridged crangon	<i>Crangon dalli</i>	<0.01 %
	Spot shrimp	<i>Pandalus platyceros</i>	<0.01 %
	Eualus sp.	<i>Eualus sp.</i>	<0.01 %
	Argis sp.	<i>Argis sp.</i>	<0.01 %
	Yellowleg pandalid	<i>Pandalus tridens</i>	<0.01 %
All other forage fish species			
	Pacific herring	<i>Clupea pallas arengus</i>	0.16 %
	Longsnout prickleback	<i>Lumpenella longirostris</i>	0.14 %
	Rainbow smelt	<i>Osmerus mordax</i>	<0.01 %
	Capelin	<i>Mallotus villosus</i>	<0.01 %
	Deepsea smelt	Family Bathylagidae	<0.01 %
	Snake prickleback	<i>Lumpenus sagitta</i>	<0.01 %
	Slender eelblenny	<i>Lumpenus fabricii</i>	<0.01 %
	Decorated warbonnet	<i>Chirolophis decoratus</i>	<0.01 %
	Crescent gunnel	<i>Fholis laeta</i>	<0.01 %
	Euphausiid	Order Euphausiacea	<0.01 %
	Daubed shanny	<i>Lumpenus maculatus</i>	<0.01 %
All other animals		59 species	1.76 %

Table 3.-Fish measurements from the 2004 Westward Region small-mesh trawl survey.

Common Name	Number Measured	Mean Length (cm)	Estimated Number Caught	Estimated Total Catch (kg)
Alaska skate	1	52.0	1	8.0
Aleutian skate	24	48.2	24	131.0
Arrowtooth flounder	601	41.1	1,806	1,504.7
Bering skate	15	27.2	15	22.3
Capelin	24	11.6	74	0.6
Deepsea smelt	17	11.6	26	0.3
Dover sole	1	39.0	4	2.2
Eulachon	2,899	17.5	71,526	2,319.9
Flathead sole	1,156	33.2	5,376	2,113.2
Light dusky rockfish	7	37.7	7	7.7
Longnose skate	3	47.7	3	23.0
Northern rockfish	2	31.0	2	1.0
Northern rock sole	3	34.3	13	6.5
Pacific cod	89	66.1	89	317.7
Pacific cod (juvenile)	10	12.2	100	1.2
Pacific cod (tagged)	159	65.9	159	544.1
Pacific halibut	29	68.9	29	146.1
Pacific herring	434	16.1	801	33.6
Pacific Ocean perch	4	30.0	4	1.4
Pacific sleeper shark	5	209.8	5	399.1
Pacific tomcod	13	21.2	110	11.9
Rainbow smelt	10	15.9	40	1.2
Rex sole	40	25.2	165	25.4
Rougheye rockfish	35	42.5	35	55.8
Sablefish	13	61.8	13	35.4
Saffron cod	12	32.7	64	20.2
Shortspine thornyhead	1	26.0	1	0.2
Spiny dogfish	163	77.3	163	472.1
Walleye pollock	2,502	38.9	9,322	5,873.7
Walleye pollock (juvenile)	3,739	10.5	74,477	643.5
Yellowfin sole	1	44.0	5	5.3
	12,012			

Table 4.-Shrimp population estimates from the 2004 Westward Region small-mesh trawl survey.

Survey Area	Stratum	No. Tows	Kg/Km	Sq. Km	Std. Error	Pop. Estimate (MT)
Inner Marmot Bay	2	8	45.8	106.19	12.19	498
Marmot Island	2	2	42.9	28.81	3.52	126
	3	4	72.7	52.48	6.52	391
	4	2	6.3	164.29	3.26	106
	5	7	10.6	171.50	6.05	186
Section Total						809
Chiniak Bay	2	2	3.7	10.46	3.65	3
	3	4	5.1	20.51	3.85	10
	4	1	0.1	7.03	-	0
	5	1	1.1	13.82	-	1
Section Total						14
Wide Bay	2	6	141.8	25.14	69.97	365
	3	1	0.0	3.43	-	0
Wide Bay Total						365
Shelikof Strait	1	18	8.6	1543.46	1.83	1362
Nakalilok Bay	1	2	20.3	19.31	11.03	40
Chiginagak Bay	1	2	26.8	16.26	18.24	44
Chignik Bay	2	8	45.8	115.59	17.00	542
	3	3	10.4	36.01	10.32	38
Section Total						580
Kuiukta Bay	1	4	40.5	54.54	15.46	226
Mitrofanina Island	2	3	0.5	60.02	0.41	3
Stepovak Bay	2	3	0	246.95	-	0
	4	2	4.8	205.79	3.56	101
Section Total						101
Beaver Bay	1	2	0.2	82.32	0.2	1
Unga Strait	1	7	14.5	182.47	6.13	272

Table 5.-Sidestriped shrimp population estimates from the 2004 Westward Region small-mesh trawl survey.

Survey Area	Stratum	No. Tows	Kg/Km	Sq. Km	Std. Error	Pop. Estimate (MT)
Inner Marmot Bay	2	8	1.0	106.19	0.41	10
Marmot Island	2	2	3.3	28.81	2.32	9
	3	4	2.8	52.48	1.62	15
	4	2	0.1	164.29	0.12	2
	5	7	7.1	171.50	0.98	30
Section Total						56
Chiniak Bay	2	2	0	10.46	0	0
	3	4	0.1	20.51	0.05	0
	4	1	0	7.03	-	0
	5	1	0.3	13.82	-	0
Section Total						0
Wide Bay	2	6	0	25.14	0	0
	3	1	0	3.43	-	0
Wide Bay Total						0
Shelikof Strait	1	18	3.8	1543.46	1.07	608
Nakalilok Bay	1	2	1.0	19.31	0.38	1
Chiginagak Bay	1	2	5.7	16.26	5.67	9
Chignik Bay	2	8	2.2	115.59	1.51	26
	3	3	0	36.01	0.00	0
Section Total						26
Kuiukta Bay	1	4	3.0	54.54	1.72	16
Mitrofanía Island	2	3	0	60.02	0	0
Stepovak Bay	2	3	0	246.95	0	0
	4	2	0	205.79	0	0
Section Total						0
Beaver Bay	1	2	0	82.32	0	0
Unga Strait	1	7	0.1	182.47	0.06	1

Table 6.-Minimum acceptable biomass indices (MABI) and shrimp population estimates in metric tons from surveyed Westward Region fishing sections, 1995-2004.

District	Section	MABI ^a	Survey Year					
			2004	2003	2002	2001	1998	1995
Kodiak	Inner Marmot Bay	1,652	498	423	604	1,089	247	567
	Marmot Island	11,615	809	1,407	1,315	1,703	230	-
	Chiniak Bay	658	14	84	52	311	44	76
	Ugak Bay	1,815	-	2	-	46	0	-
	Kiliuda Bay	2,405	-	146	198	51	74	59
	Two Headed Island	3,312	-	4	-	66	65	59
	Alitak Bay	1,942	-	130	-	282	107	8
	Uyak Bay	1,447	-	439	-	306	163	174
	Uganik Bay	1,175	-	403	-	704	129	446
	Kukak Bay	none	-	68	-	187	44	10
	Wide Bay ^b	476	365	384	880	967	-	36
	Puale Bay ^b	540	-	40	-	47	-	-
	Shelikof Strait ^c	none	1,362	8,527	-	1,062	-	-
	Alitak Flats	577	-	30	-	-	-	-
Chignik	Kujulik Bay	1,715	-	-	11	-	-	-
	Chignik Bay	2,064	580	-	506	-	-	467
	Chiginagak Bay	314	44	-	-	-	-	-
	Nakalilok Bay	373	40	-	-	-	-	-
	Kuiukta Bay	862	226	-	167	-	-	164
	Mitrofanina Island	2,341	3	-	97	-	-	-
South Peninsula	Ivanof Bay	2,586	-	-	8	-	-	-
	Stepovak Bay	10,526	101	-	370	-	-	-
	Unga Strait	3,412	272	-	115	-	-	-
	Beaver Bay	1,978	1	-	10	-	-	-
	Pavlof Bay ^d	8,221	64	8	38	30	59	15
	Belkofski Bay	none	-	-	1	-	-	-

^a Minimum acceptable biomass index

^b Wide and Puale Bays are part of the Mainland Section, but have individual MABIs established.

^c Shelikof Strait is part of the General Section; Area considered for the biomass estimate is not consistent between surveys.

^d Pavlof Bay surveyed by NMFS in all years except 2002.

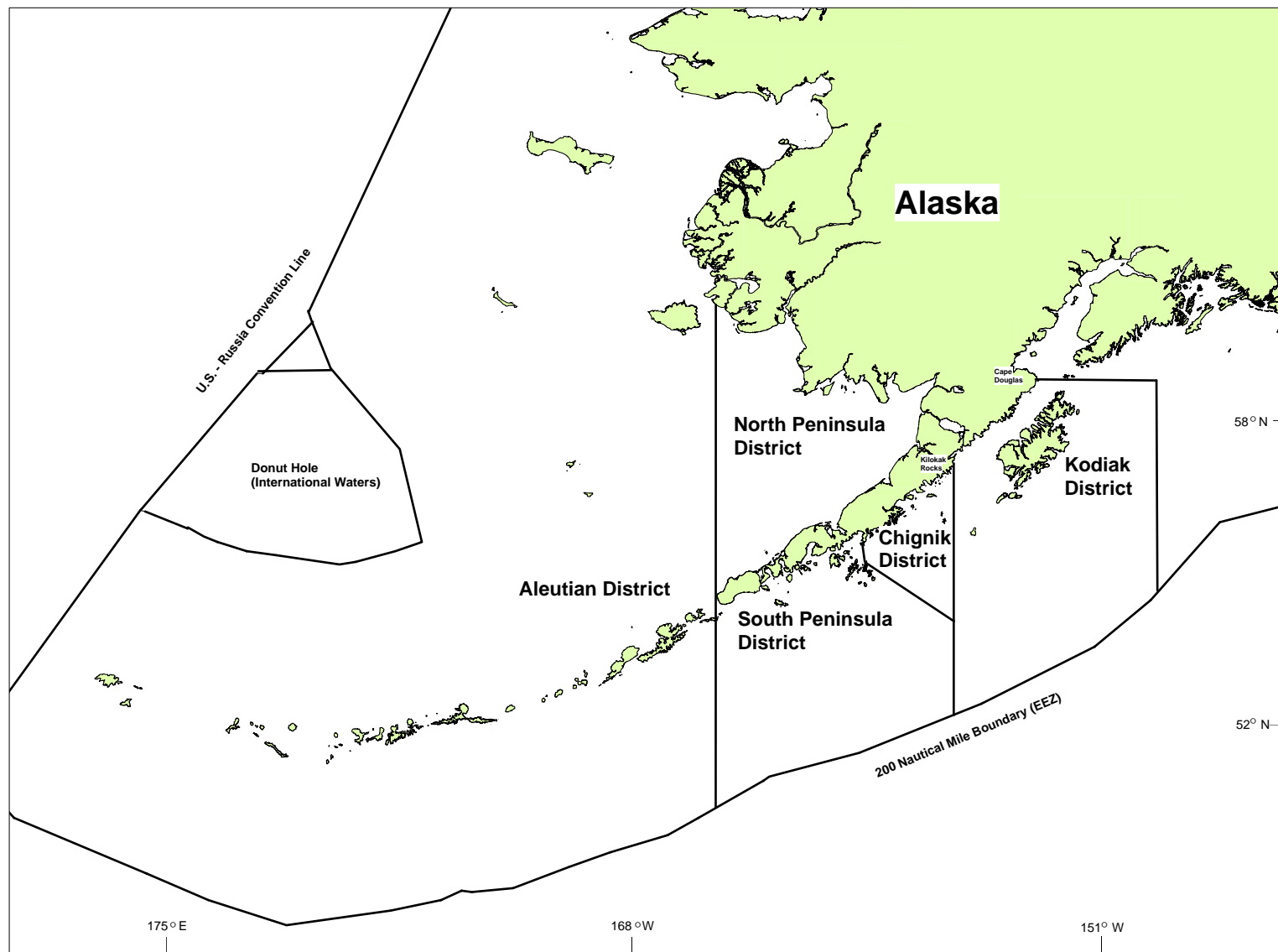


Figure 1.-Commercial shrimp fishing districts of Westward Registration Area J.

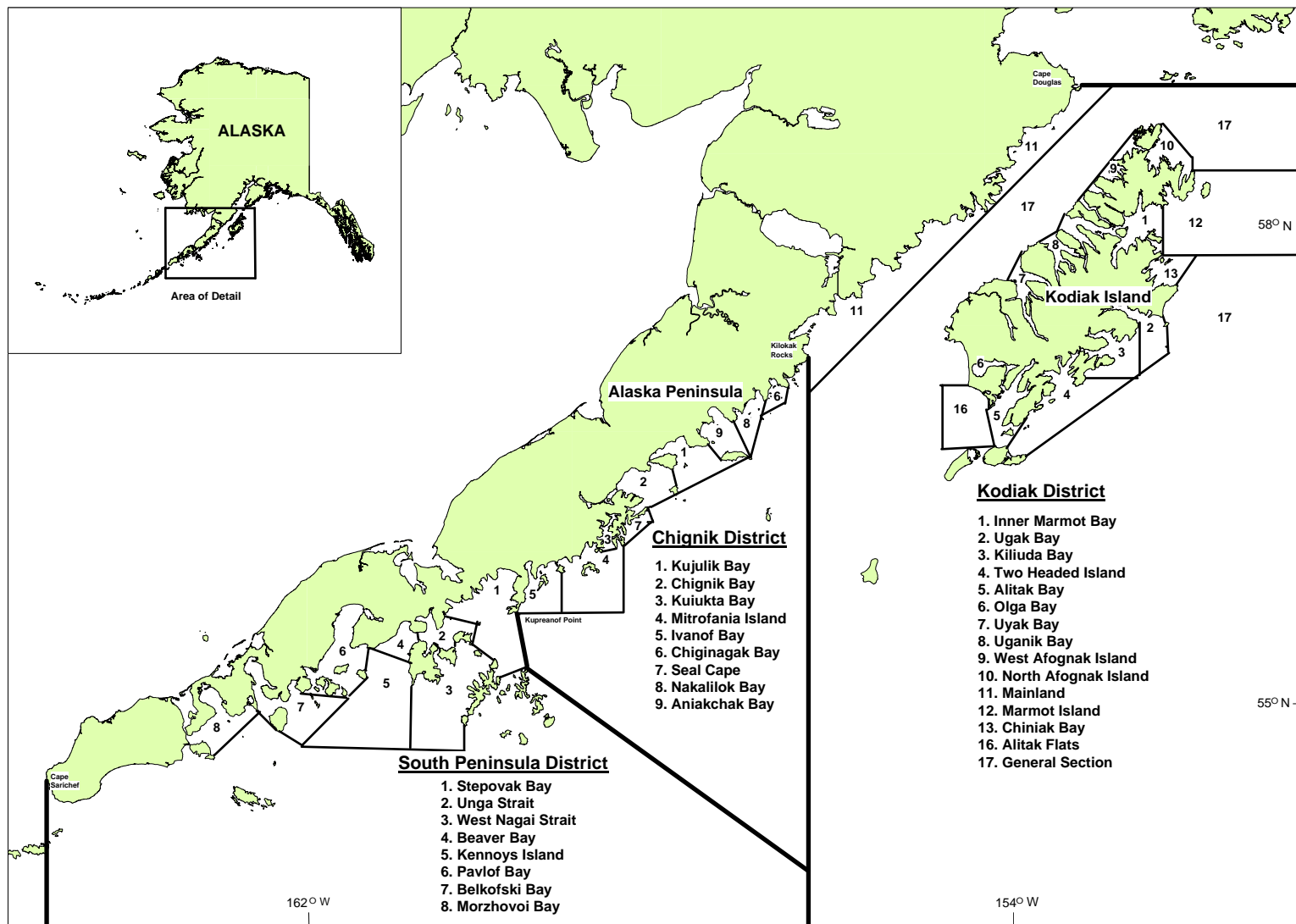


Figure 2.-Commercial shrimp fishing sections in the Kodiak, Chignik and South Peninsula Districts of Westward Area J.

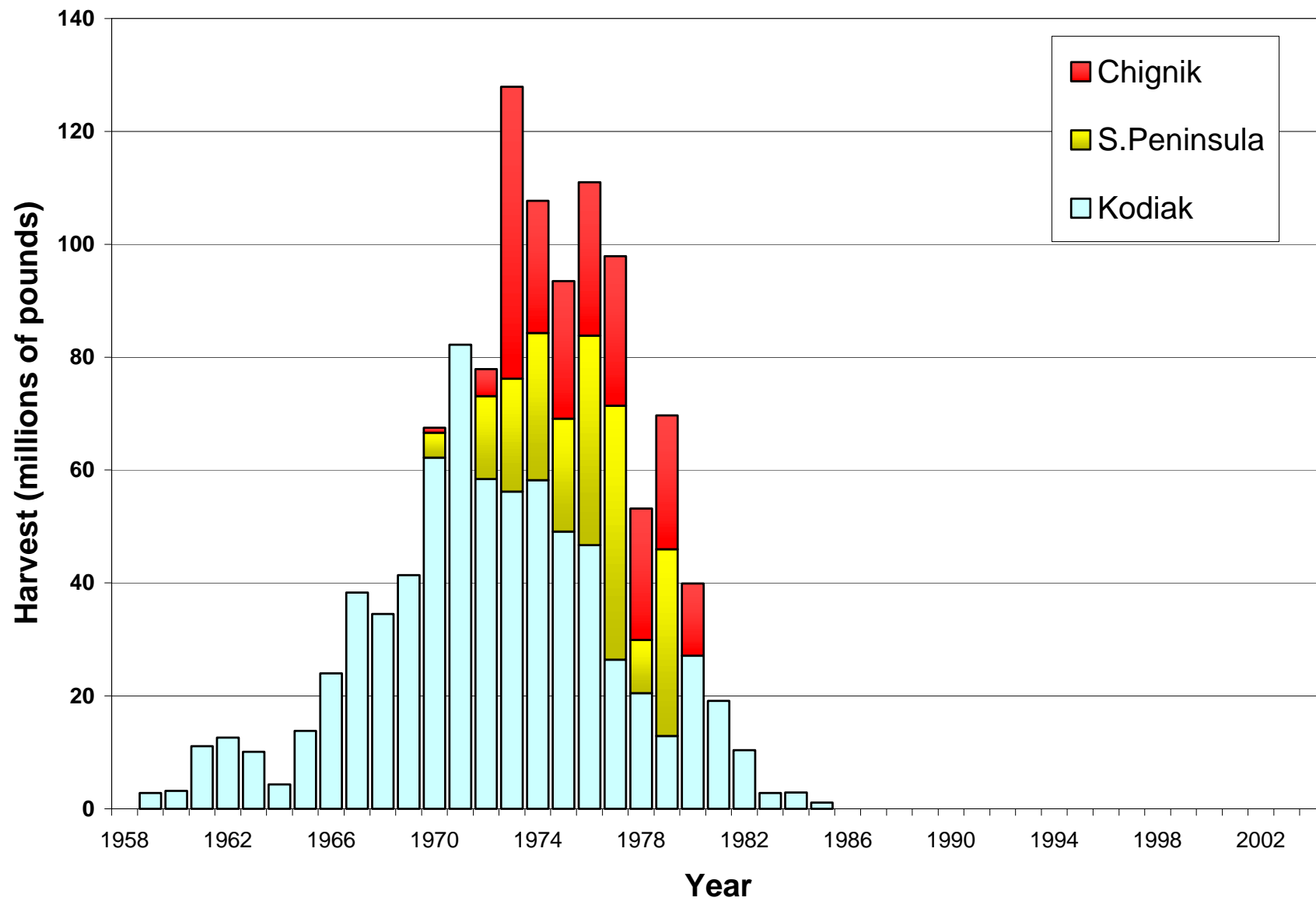


Figure 3.-Shrimp harvests from the Kodiak, Chignik, and South Peninsula Districts, 1958-2004.

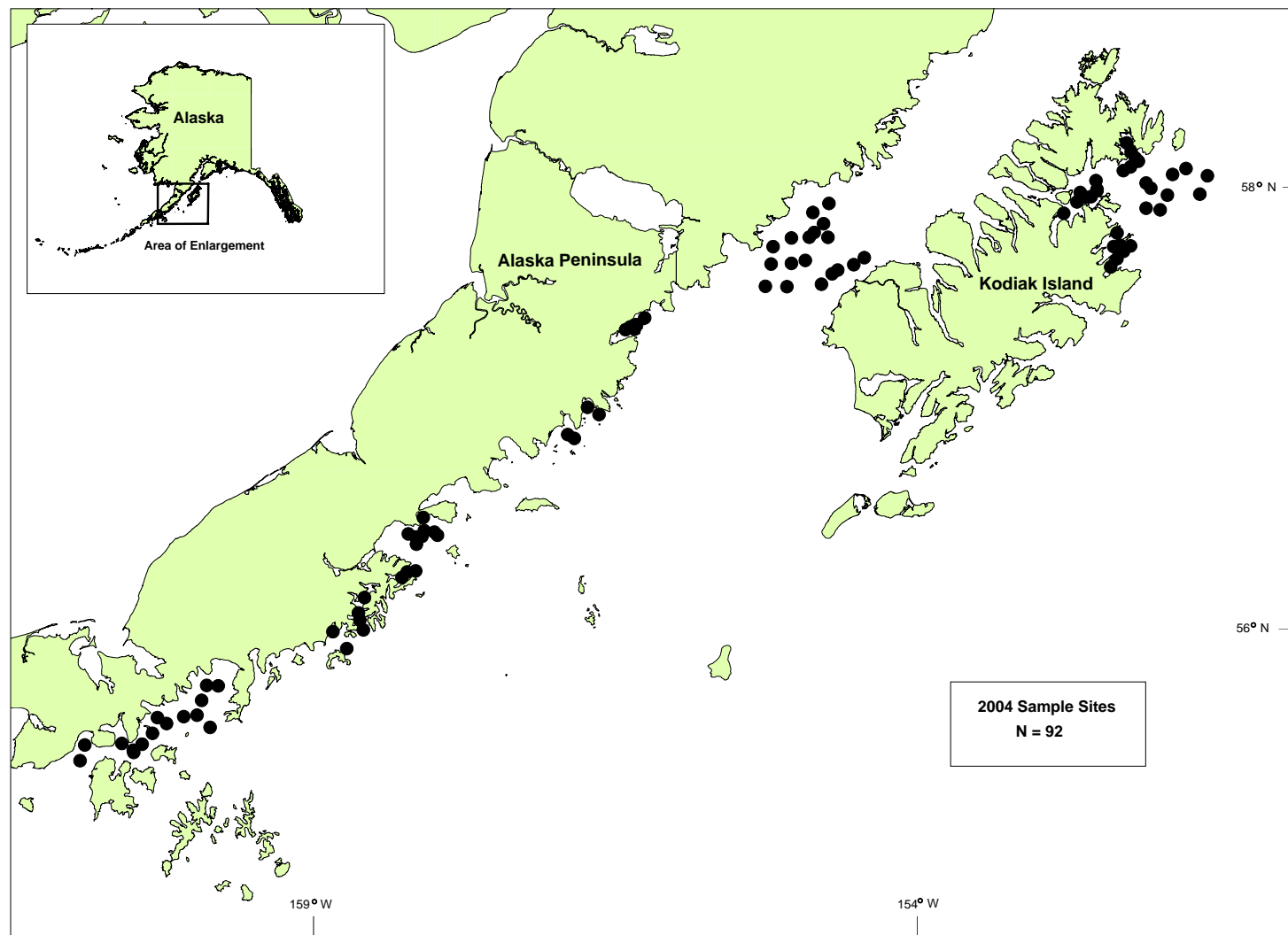


Figure 4.-Location of sample sites from the 2004 Westward Region small-mesh trawl survey.

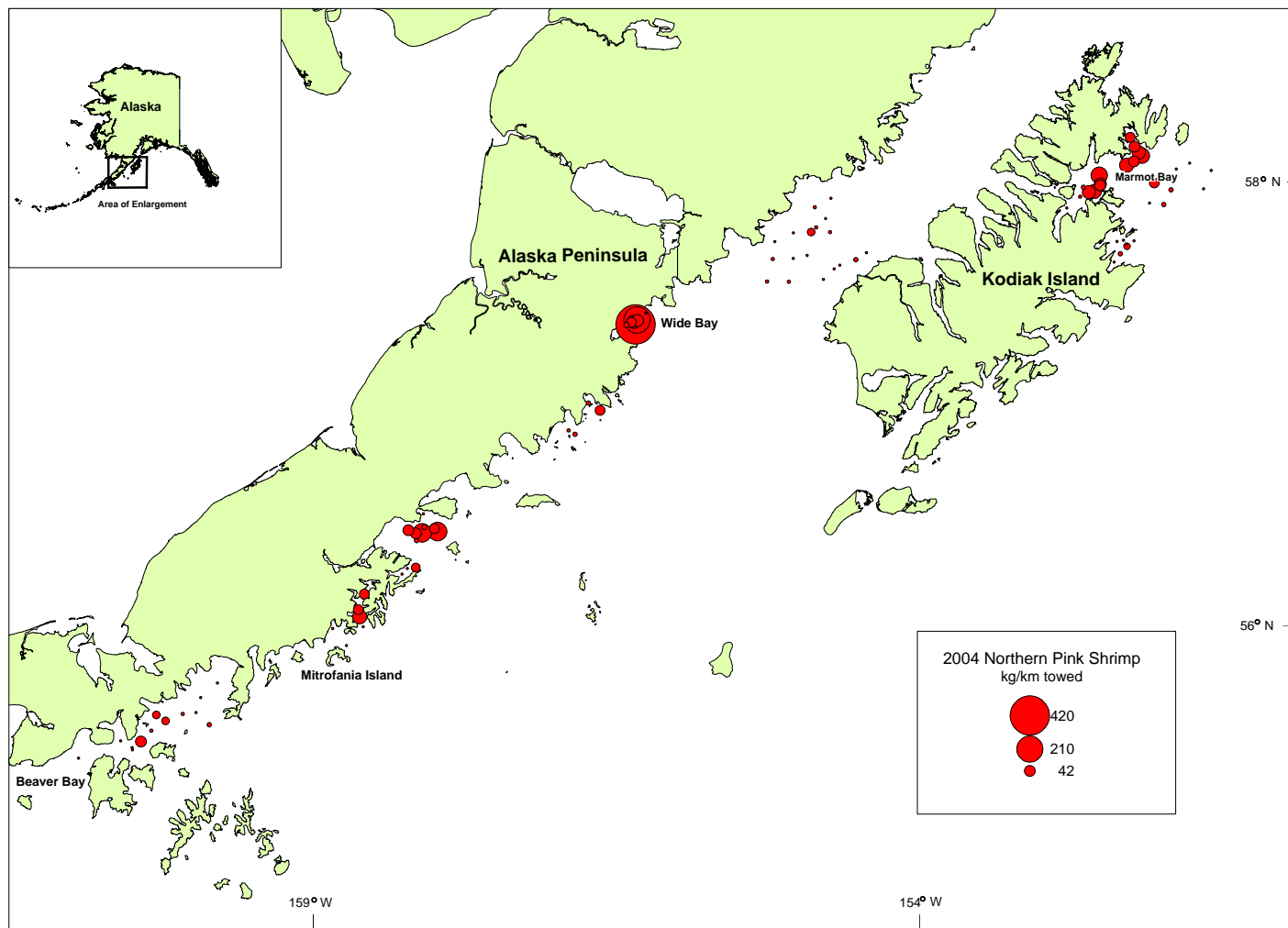


Figure 5.—Distribution and relative abundance in kg/km towed of northern pink shrimp from the 2004 Westward Region small-mesh trawl survey.

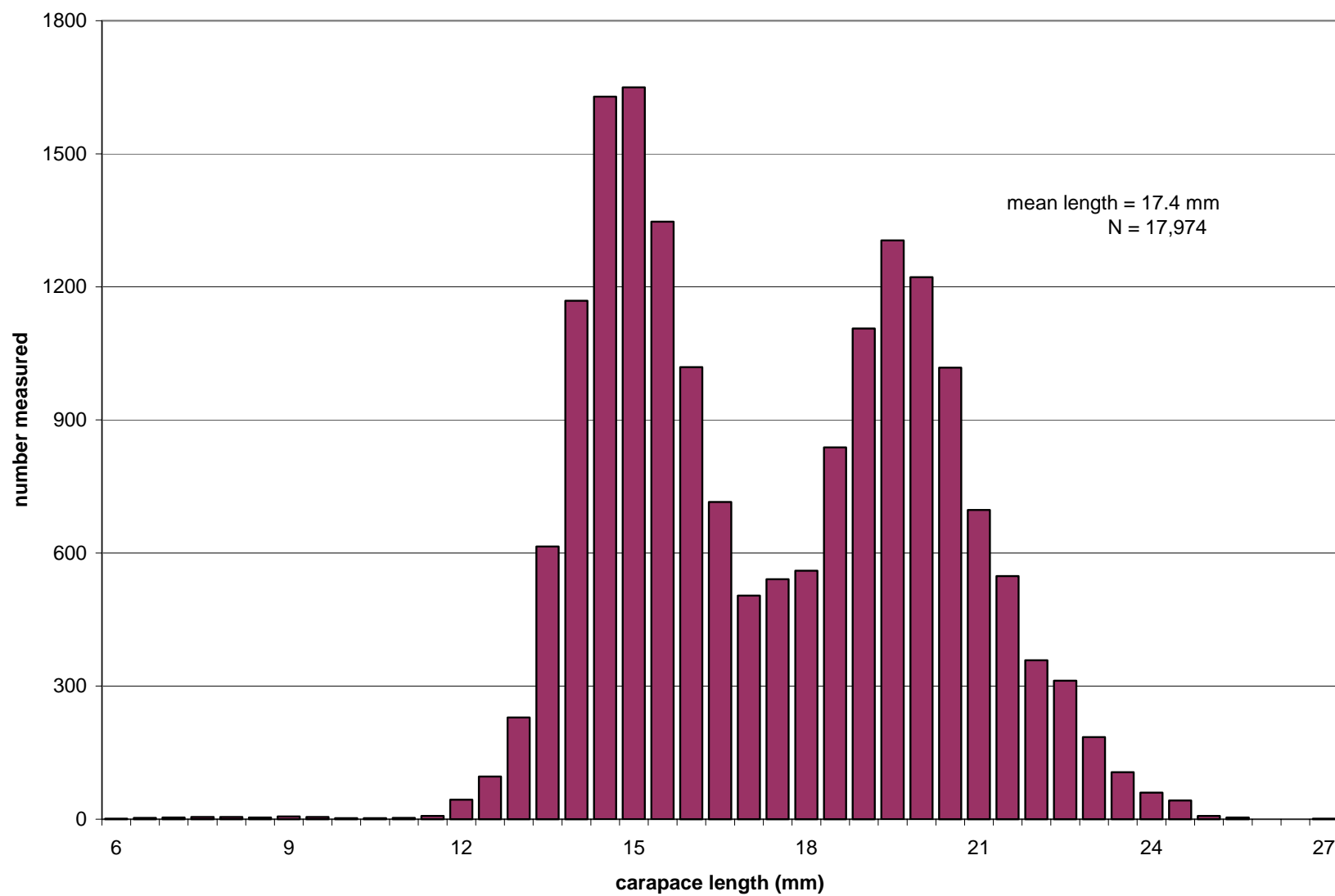


Figure 6.-Carapace lengths of northern pink shrimp from the 2004 Westward Region small-mesh trawl survey.

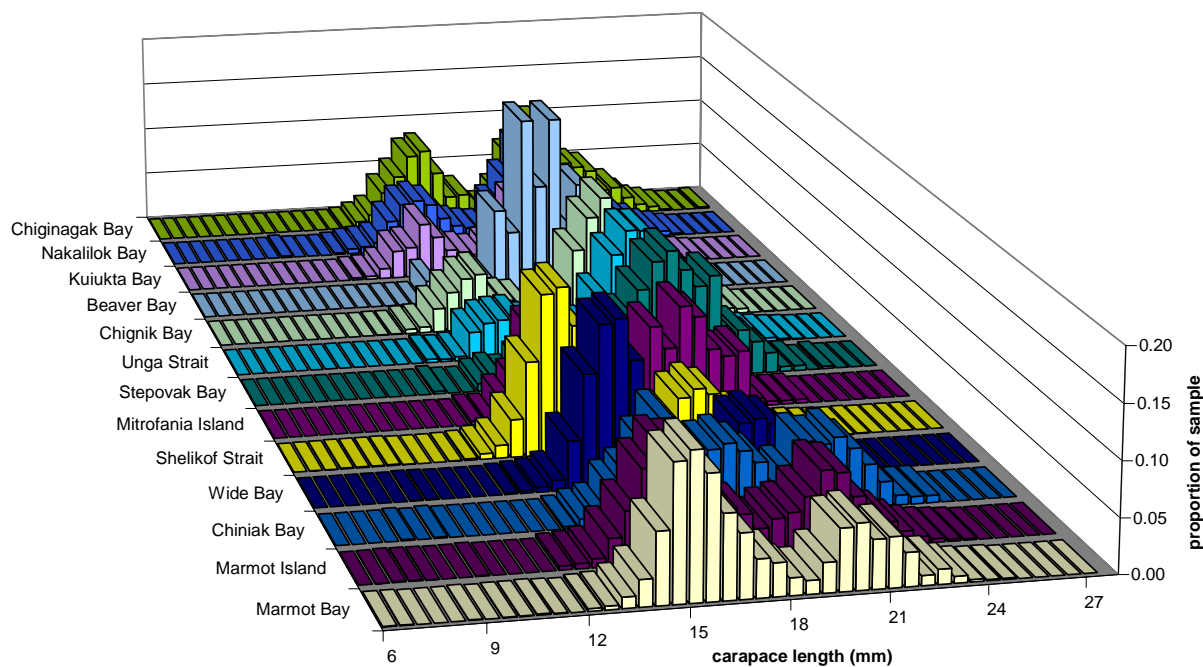
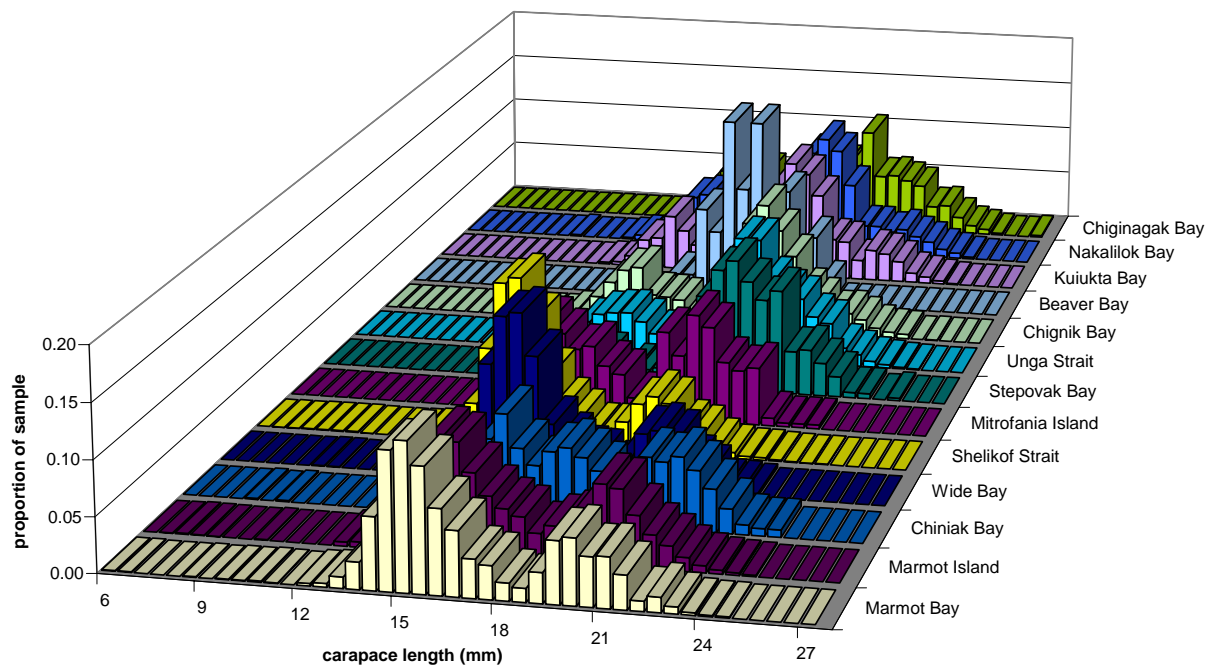


Figure 7.-Carapace lengths of northern pink shrimp by commercial fishing section from the 2004 Westward Region small-mesh trawl survey.

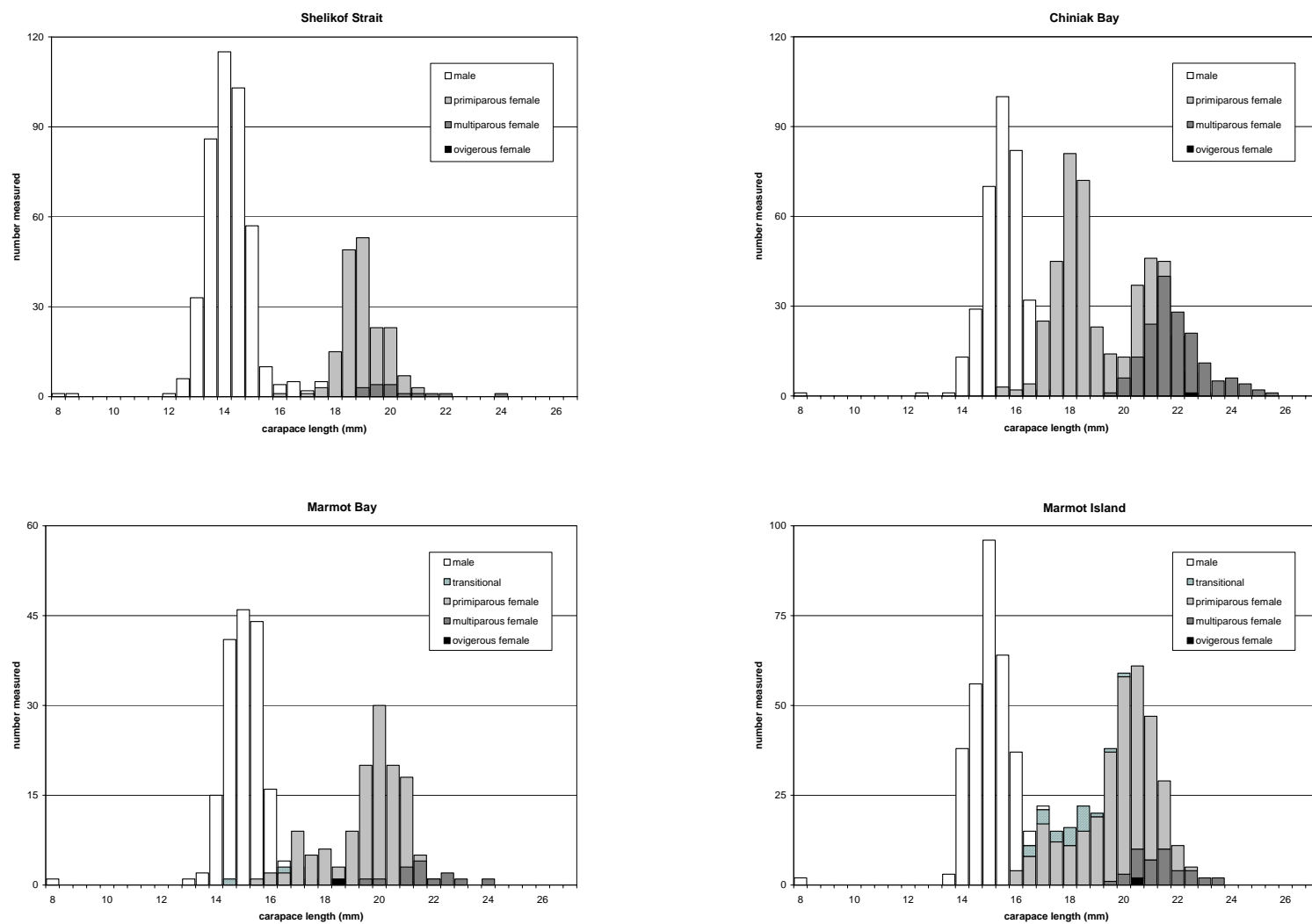


Figure 8.-Size composition by sex of northern pink shrimp from the 2004 Westward Region small-mesh trawl survey of Shelikof Strait and the Chiniak Bay, Marmot Bay and Marmot Island commercial shrimp fishing sections.

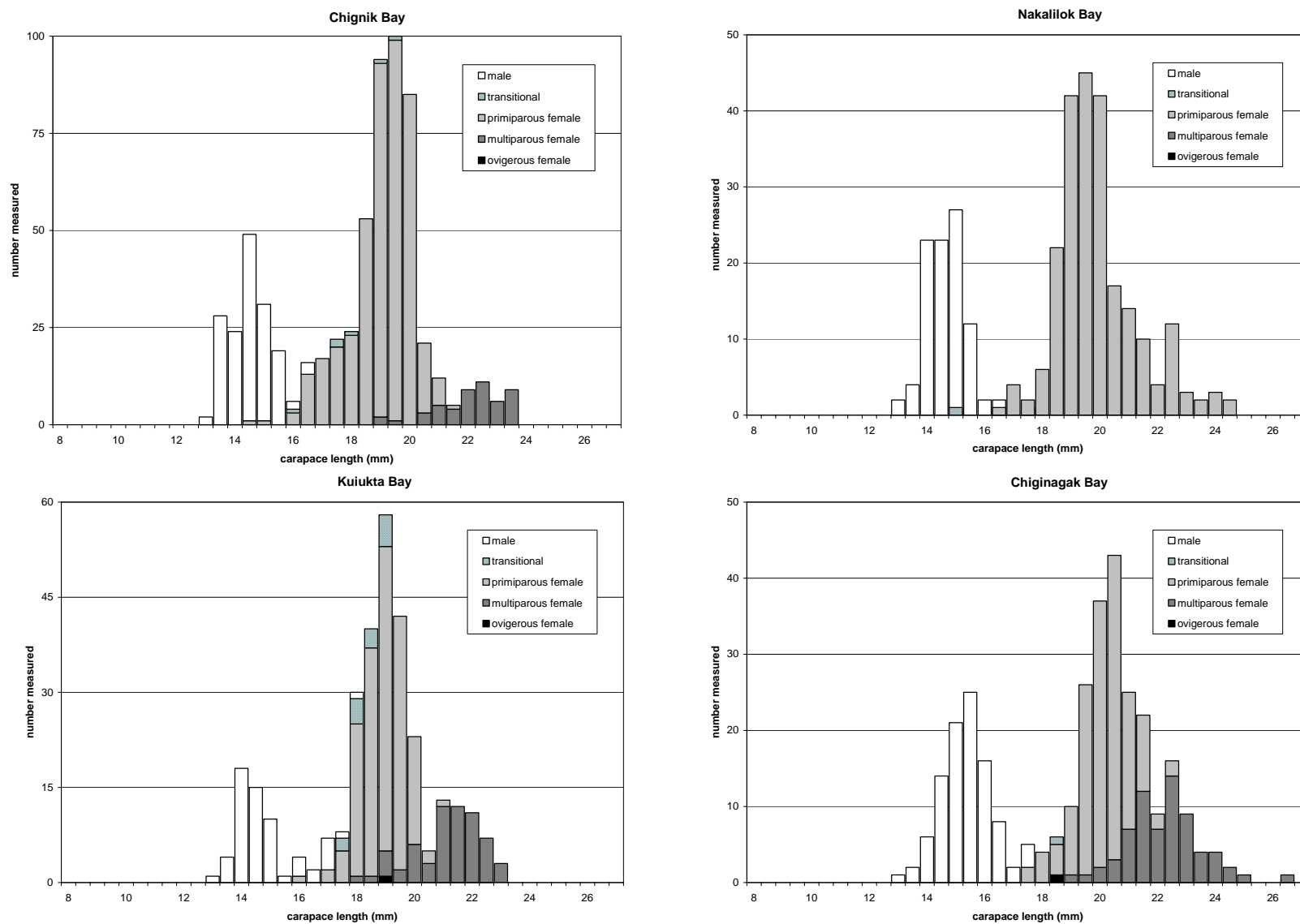


Figure 9.—Size composition by sex of northern pink shrimp from the 2004 Westward Region small-mesh trawl survey of the Chignik Bay, Nakalilok Bay, Kuiukta Bay and Chiginagak Bay commercial shrimp fishing sections.

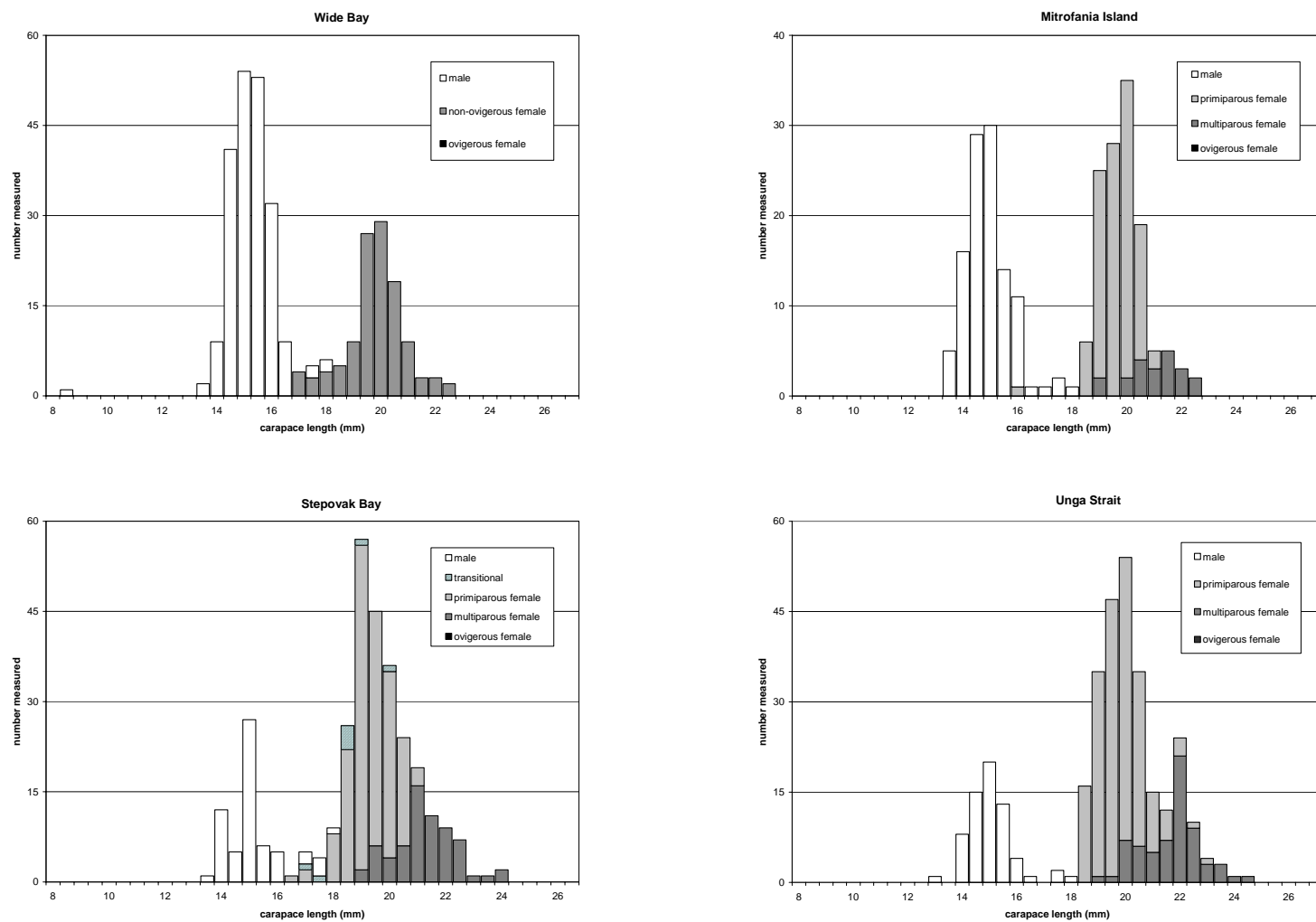


Figure 10.-Size composition by sex of northern pink shrimp from the 2004 Westward Region small-mesh trawl survey of Wide Bay and the Mitrofanina Island, Stepovak Bay and Unga Strait commercial fishing sections.

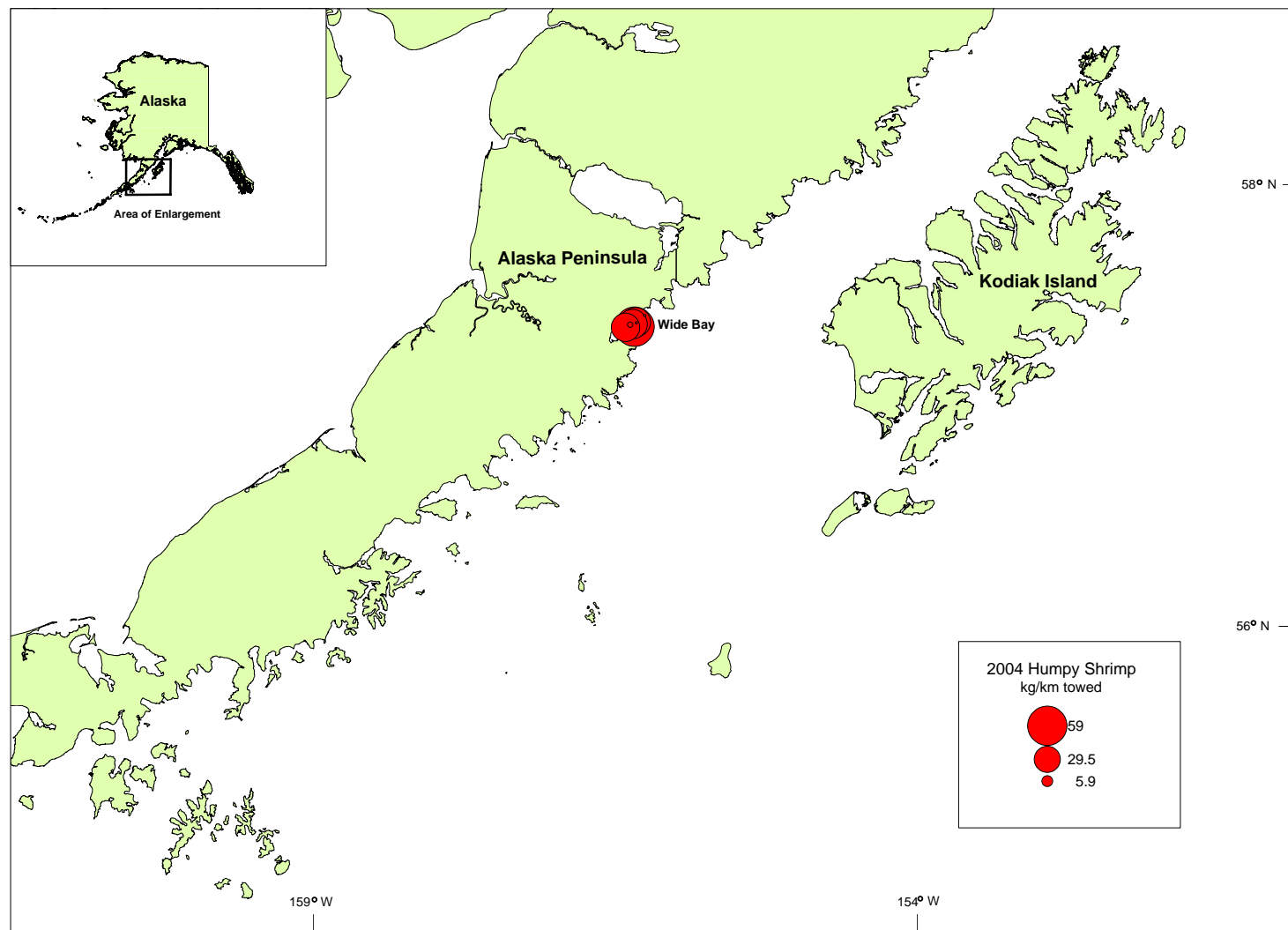


Figure 11.-Distribution and relative abundance in kg/km towed of humpy shrimp from the 2004 Westward Region small-mesh trawl survey.

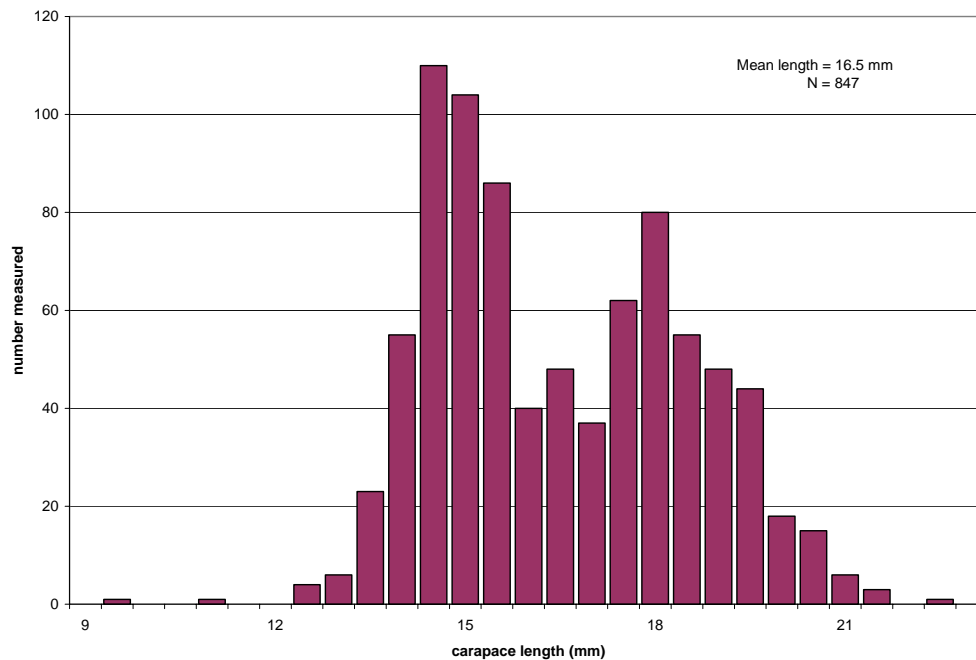


Figure 12.-Carapace lengths of humpy shrimp from the 2004 Westward Region small-mesh trawl survey.

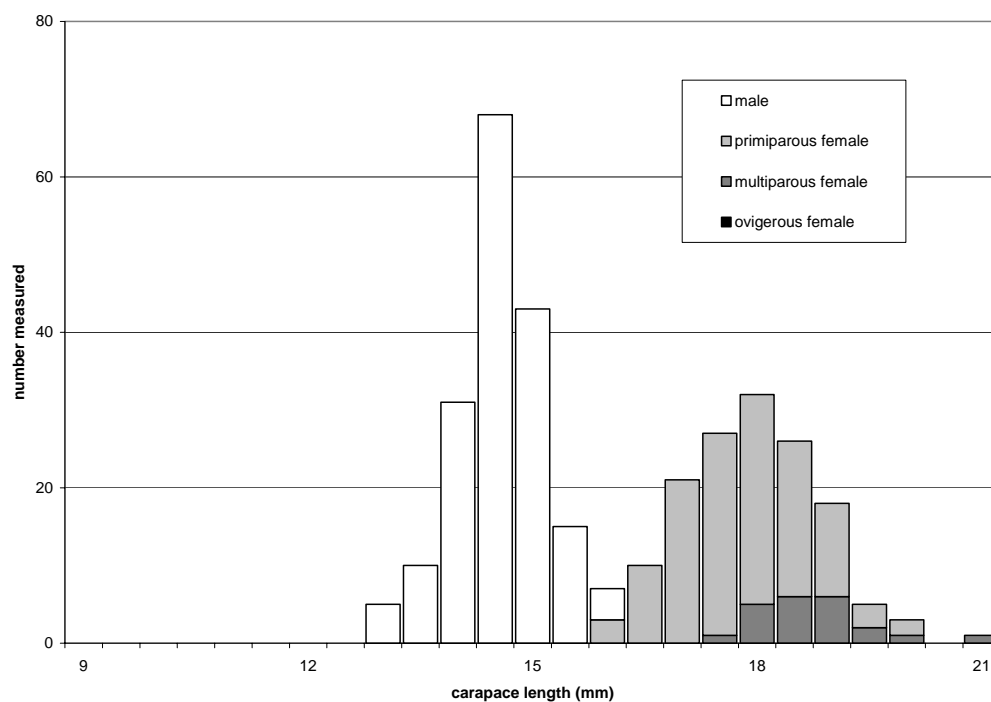


Figure 13.-Size composition by sex of Wide Bay humpy shrimp from the 2004 Westward Region small-mesh trawl survey.

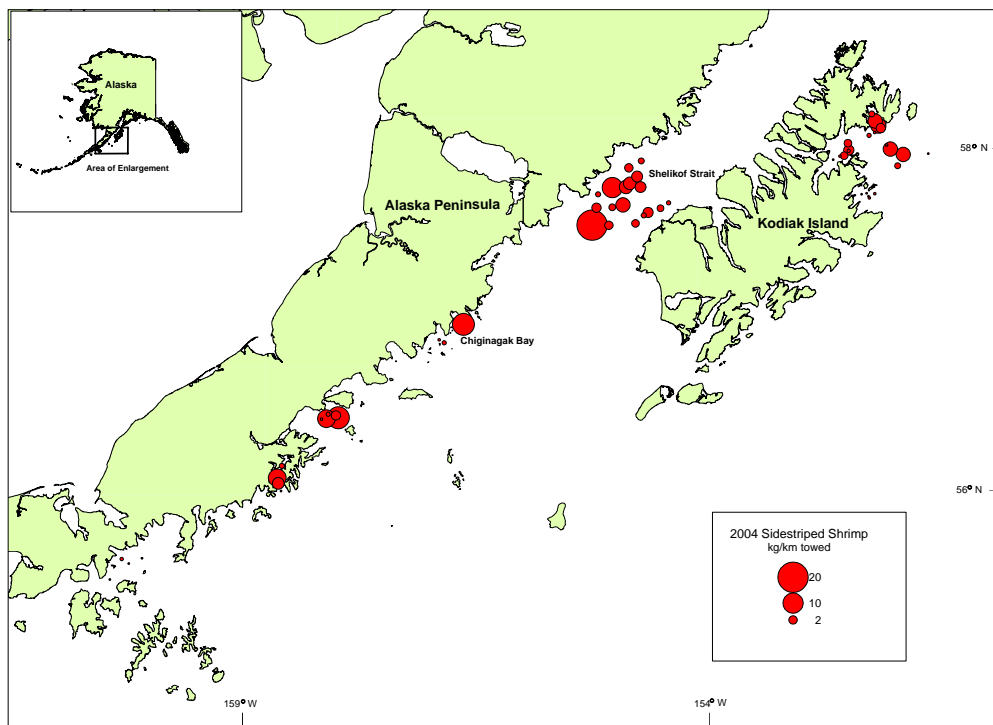


Figure 14.-Distribution and relative abundance in kg/km towed of sidestriped shrimp from the 2004 Westward Region small-mesh trawl survey.

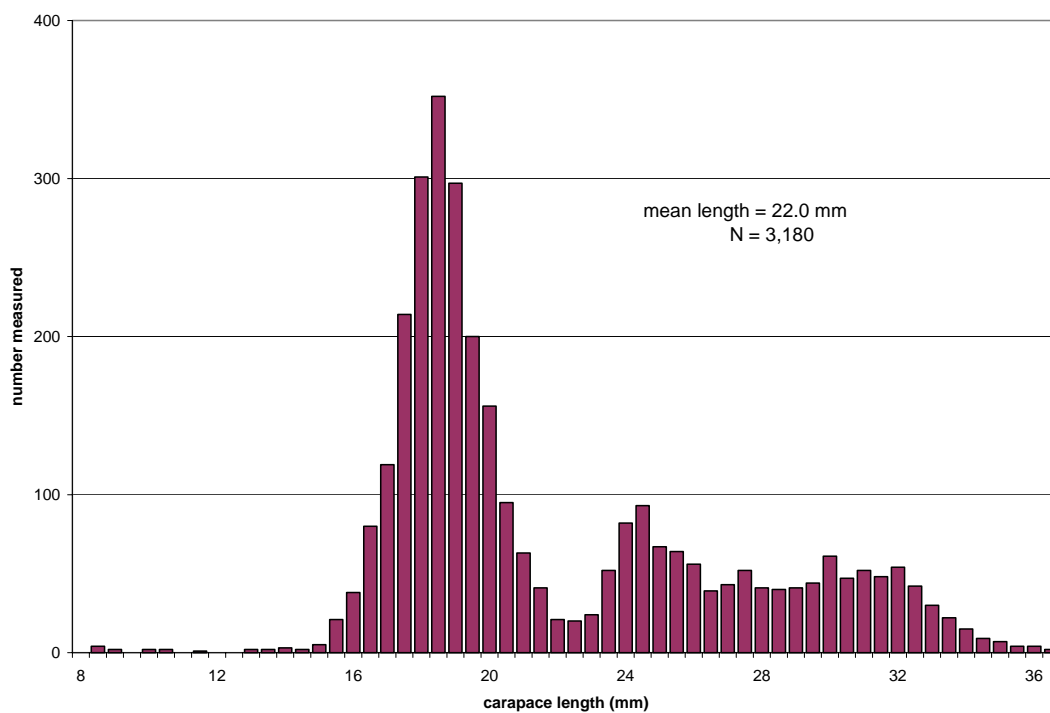


Figure 15.-Carapace lengths of sidestriped shrimp from the 2004 Westward Region small-mesh trawl survey.

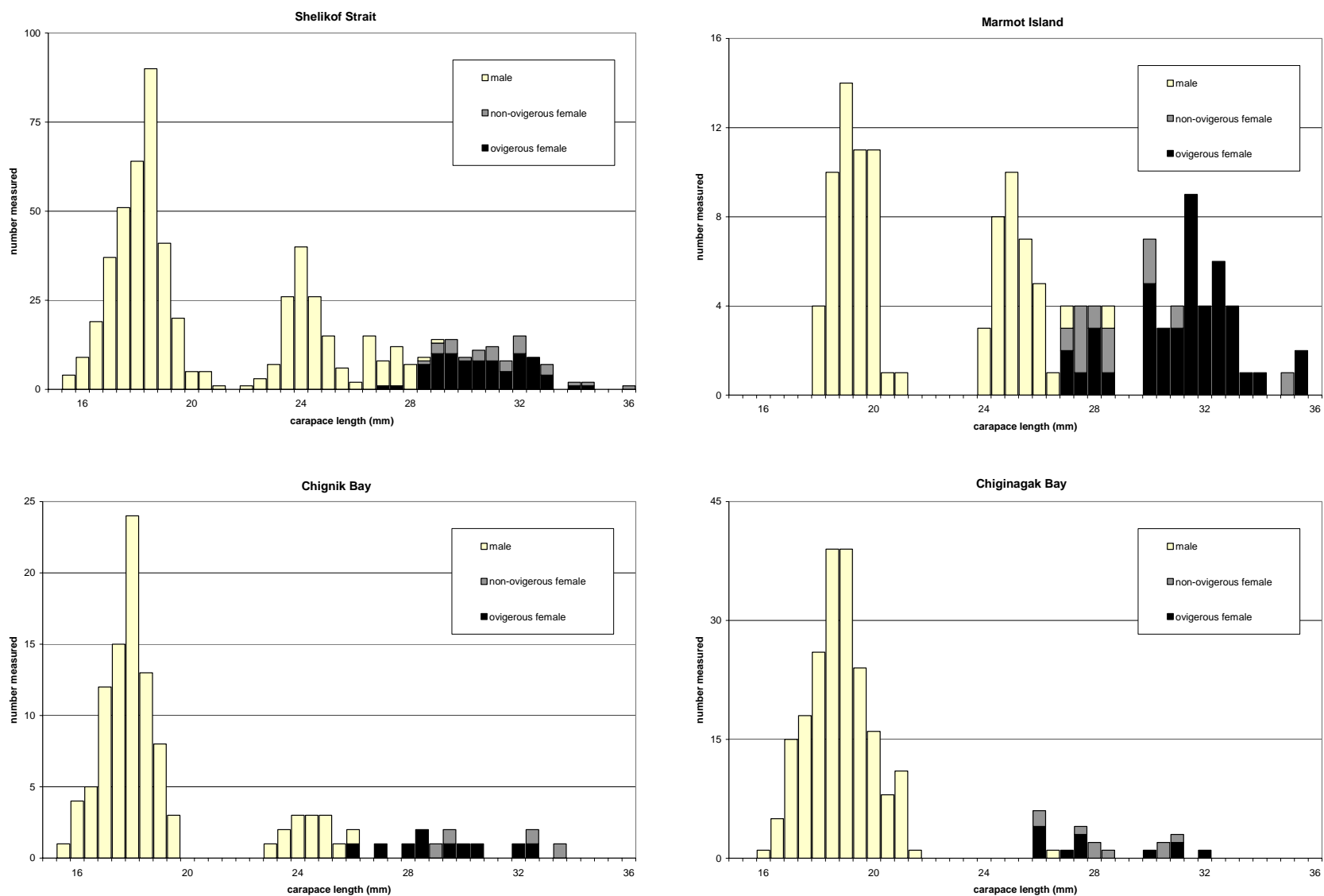


Figure 16.-Size composition by sex of sidestriped shrimp from the 2004 Westward Region small-mesh trawl survey of Shelikof Strait and the Marmot Island, Chignik Bay and Chigninagak Bay commercial shrimp fishing sections.

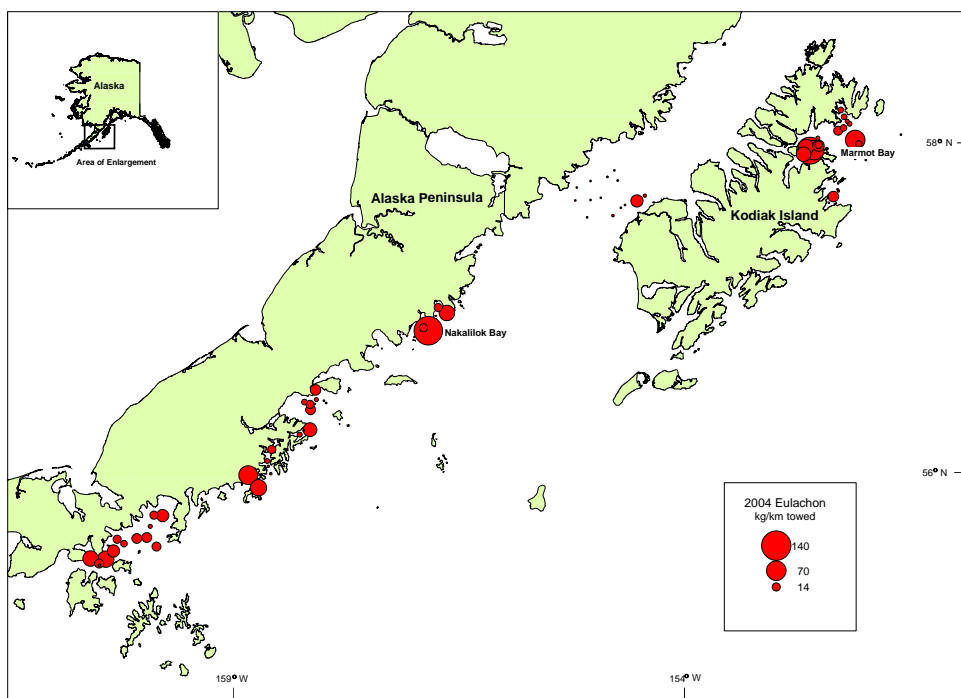


Figure 17.-Distribution and relative abundance in kg/km towed of eulachon from the 2004 Westward Region small-mesh trawl survey.

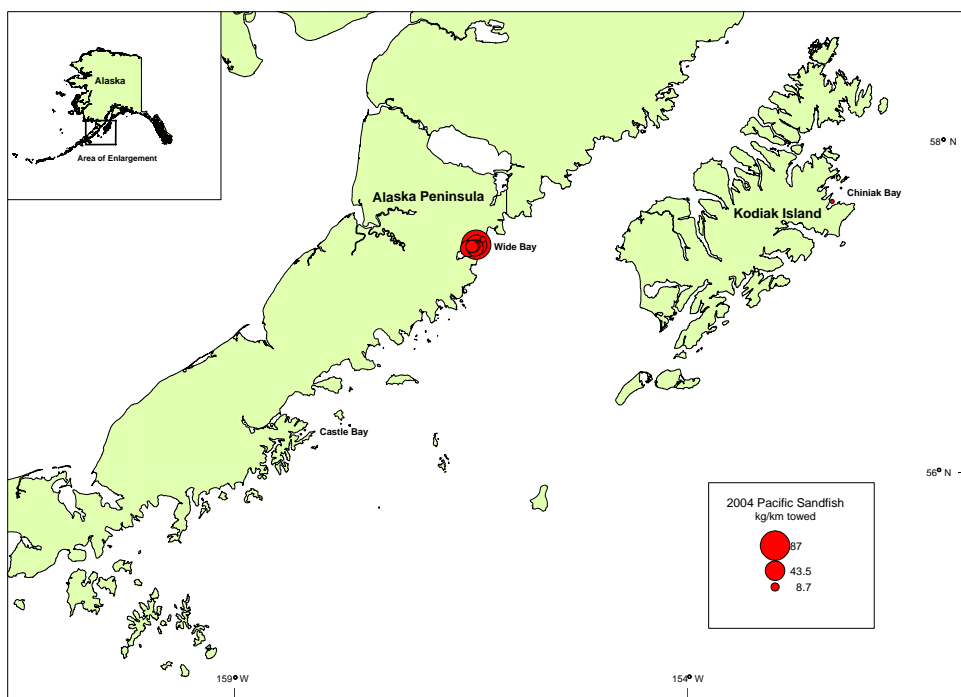


Figure 18.-Distribution and relative abundance in kg/km towed of Pacific sandfish from the 2004 Westward Region small-mesh trawl survey.

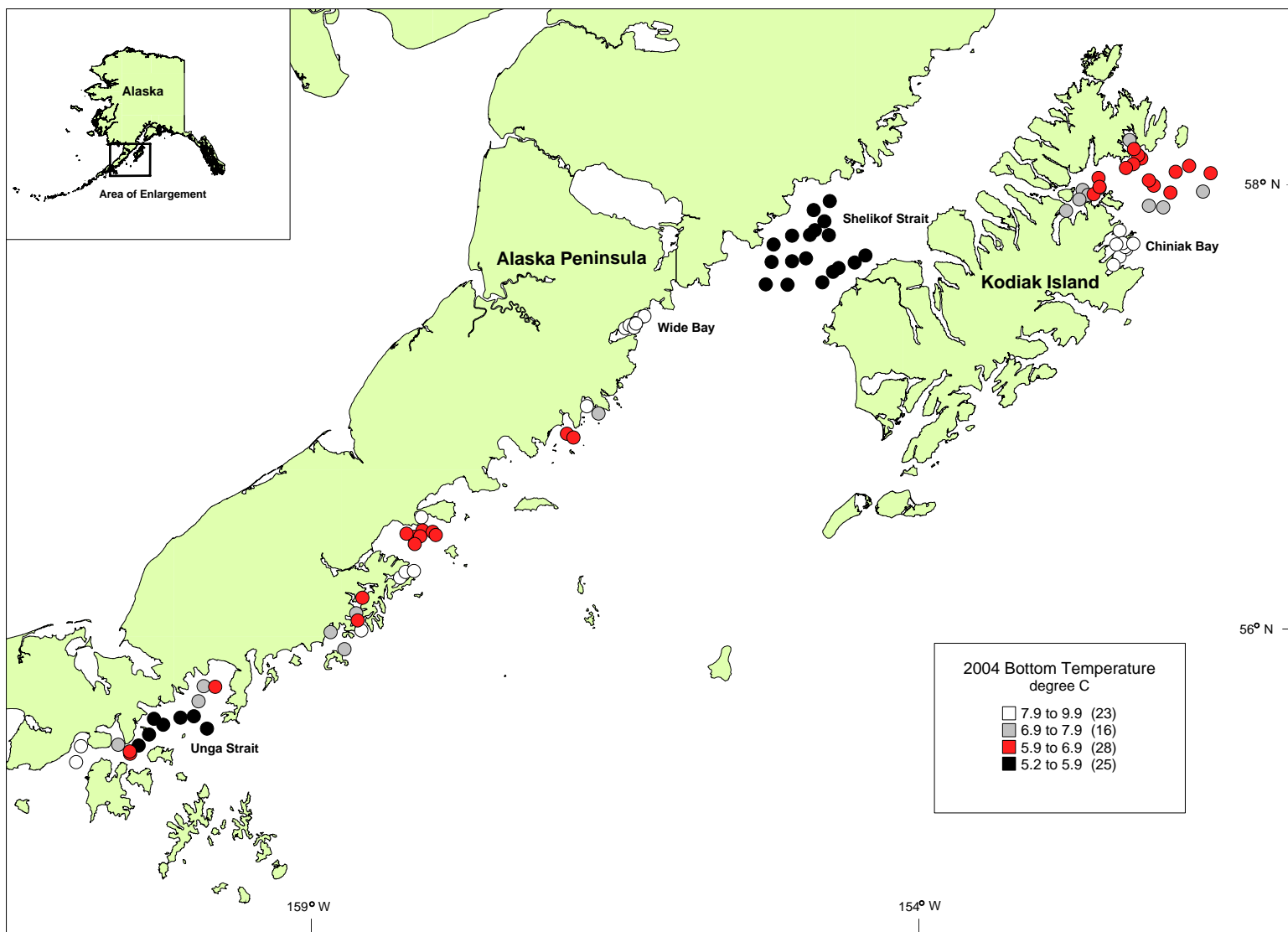


Figure 19.-Ocean bottom temperatures from the 2004 Westward Region small-mesh trawl survey.

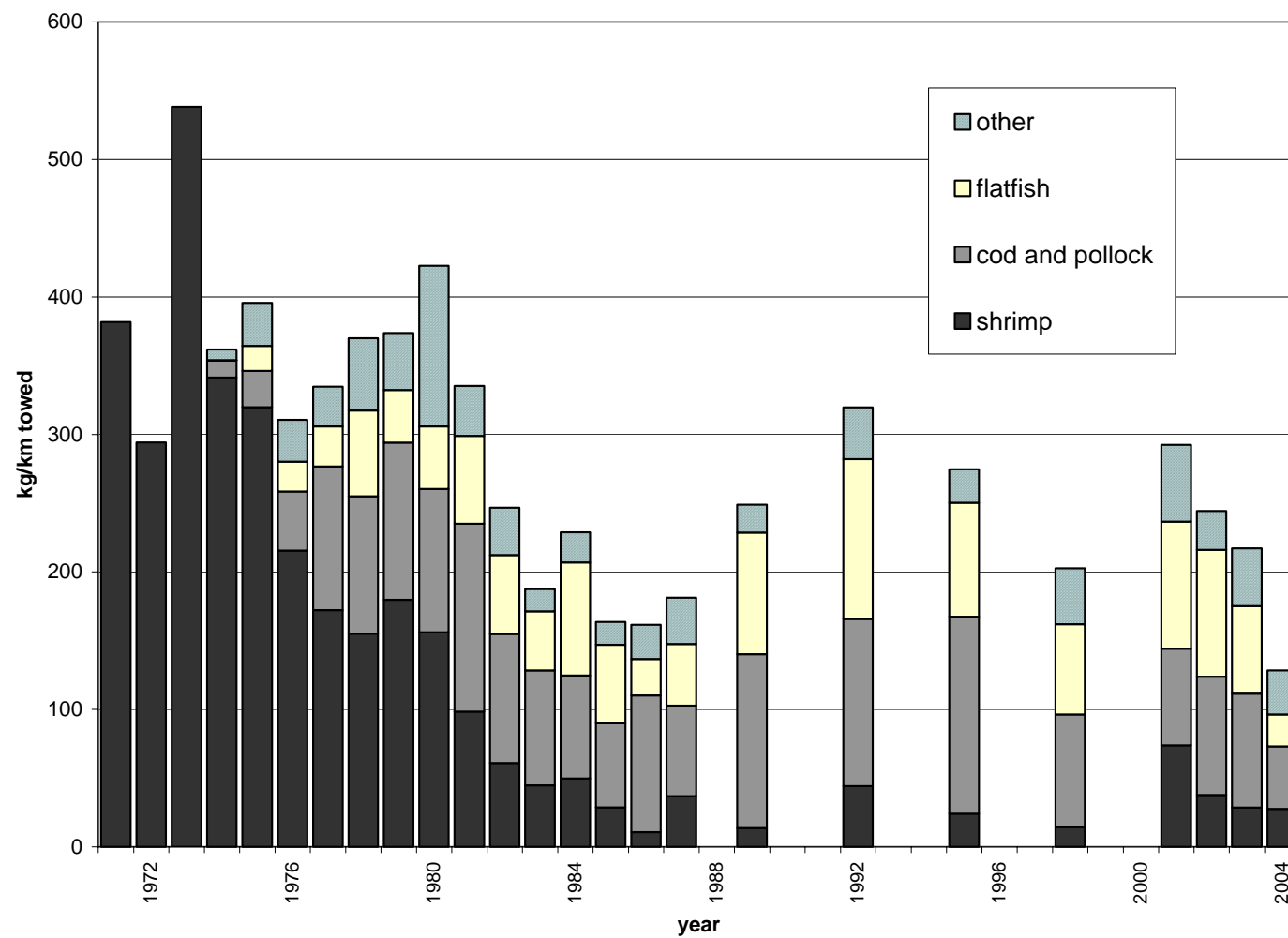


Figure 20.-Relative abundance in kg/km towed of main species groups from the Westward Region small-mesh trawl survey, 1971-2004.

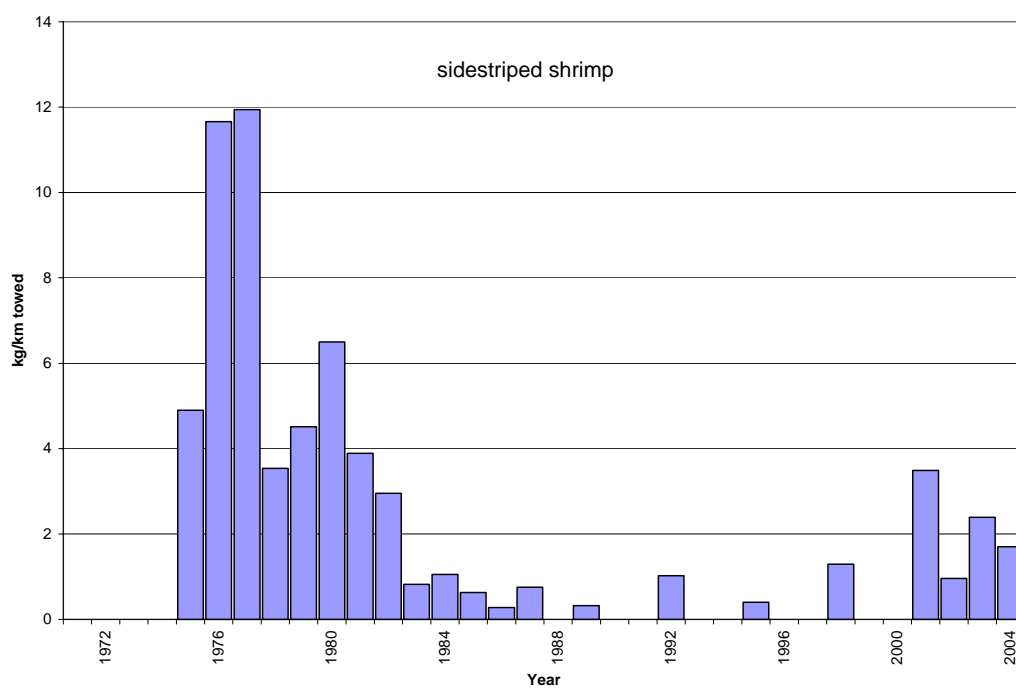
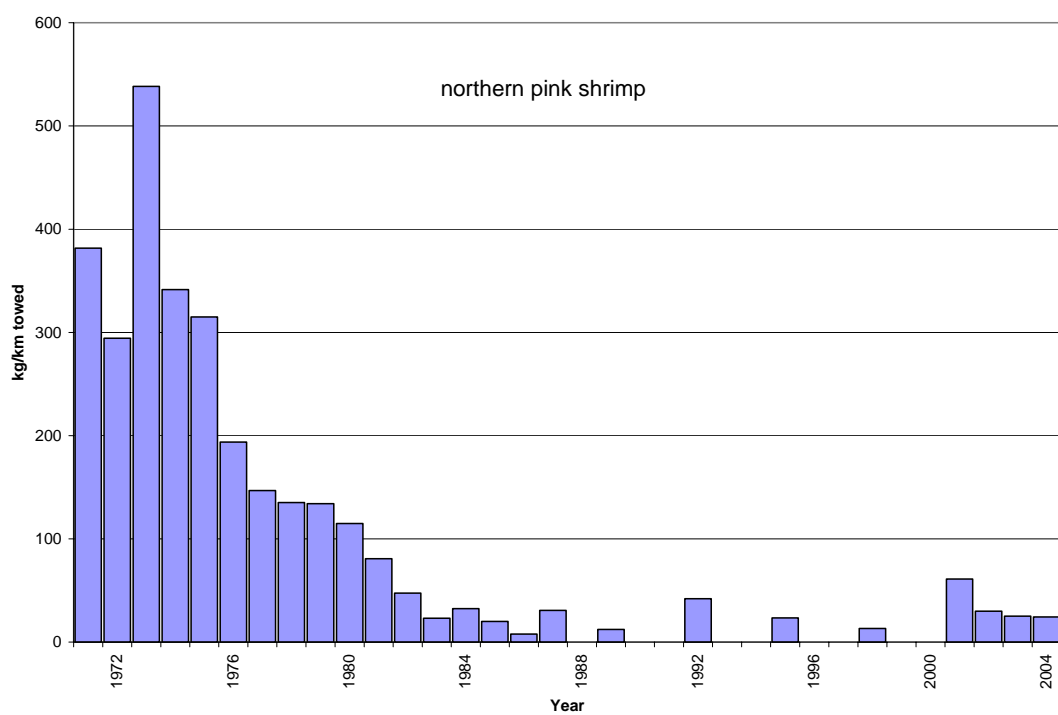


Figure 21.-Relative abundance in kg/km towed of northern pink shrimp and sidestriped shrimp from the Westward Region small-mesh trawl survey, 1971-2004.

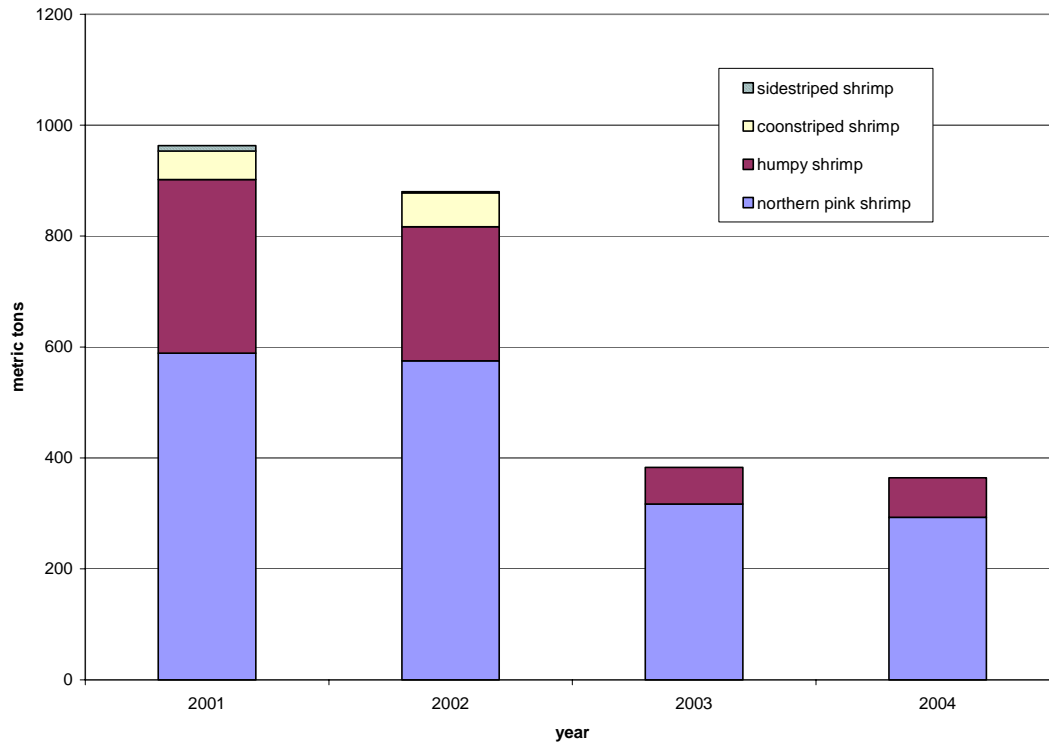


Figure 22.-Shrimp abundance estimates from Wide Bay, 2001-2004.

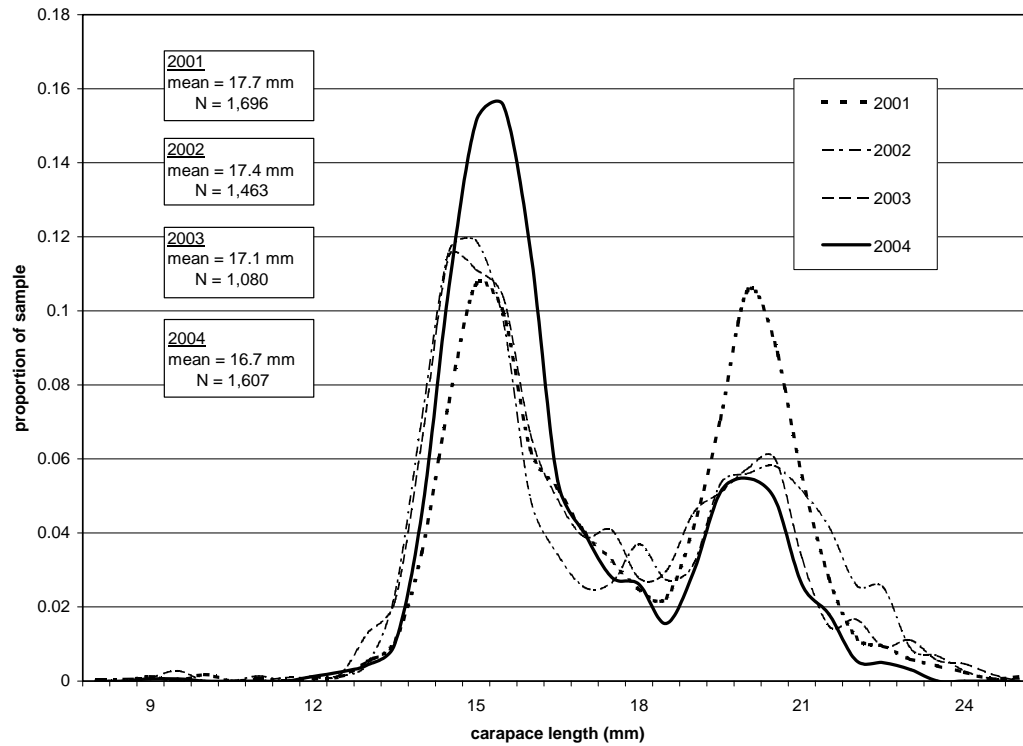


Figure 23.-Carapace lengths of northern pink shrimp from Wide Bay, 2001-2004.

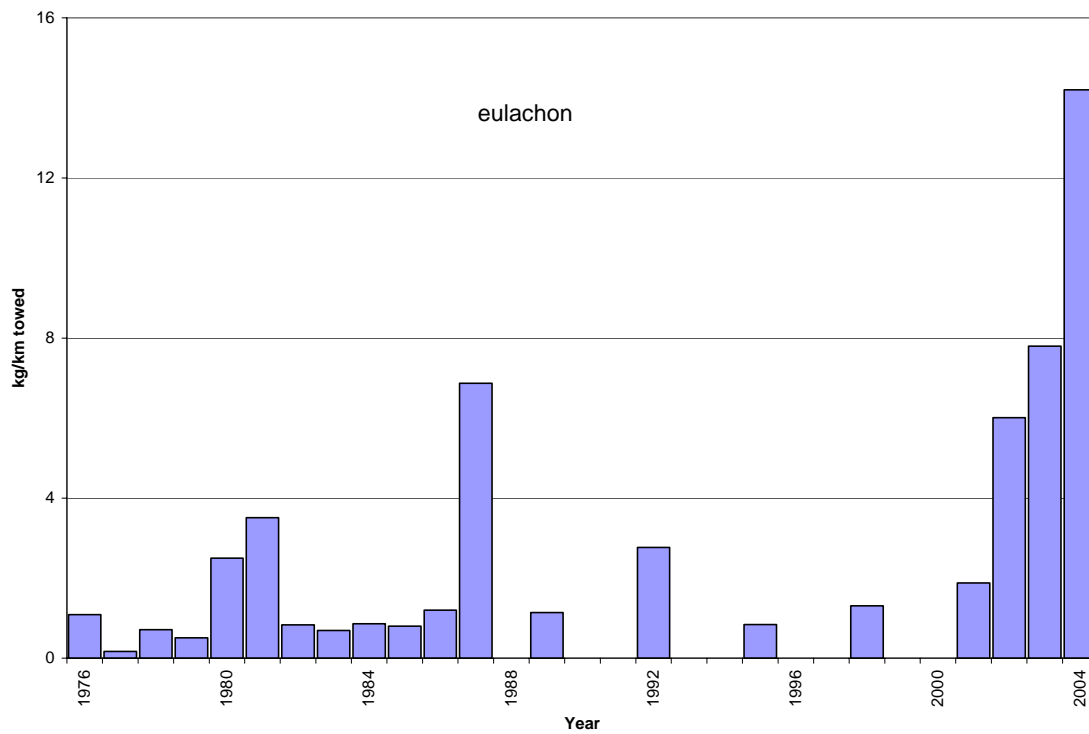


Figure 24.-Relative abundance in kg/km towed of eulachon from the Westward Region small-mesh trawl survey, 1976-2004.

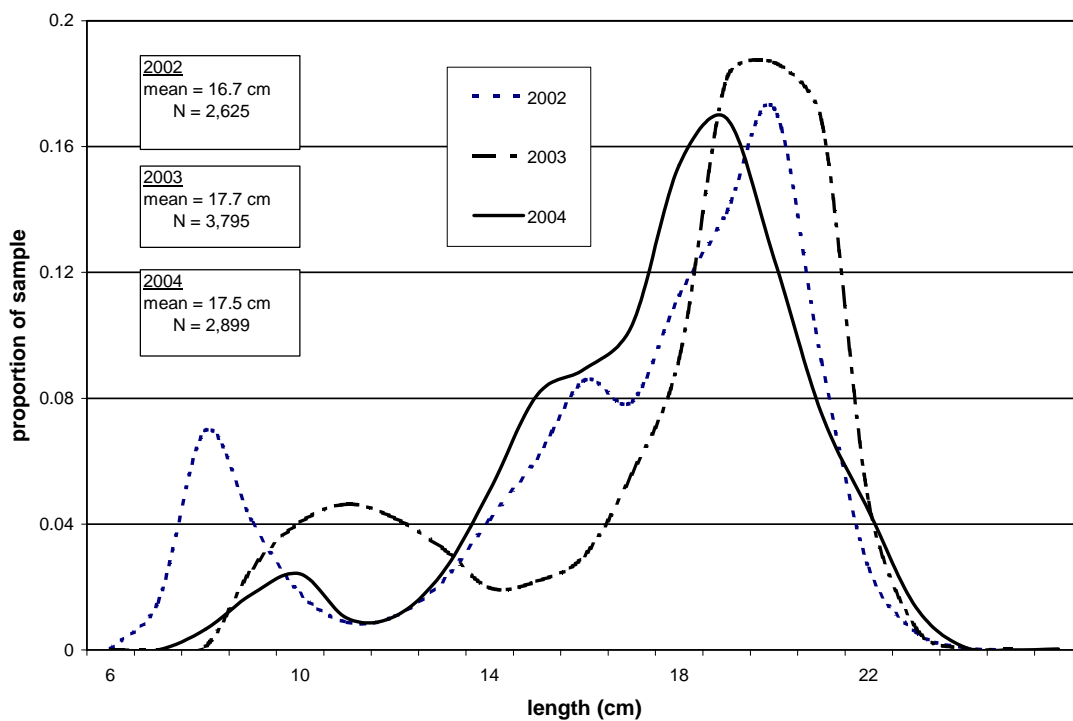


Figure 25.-Length of eulachon from the Westward Region small-mesh trawl survey, 2002-2004.

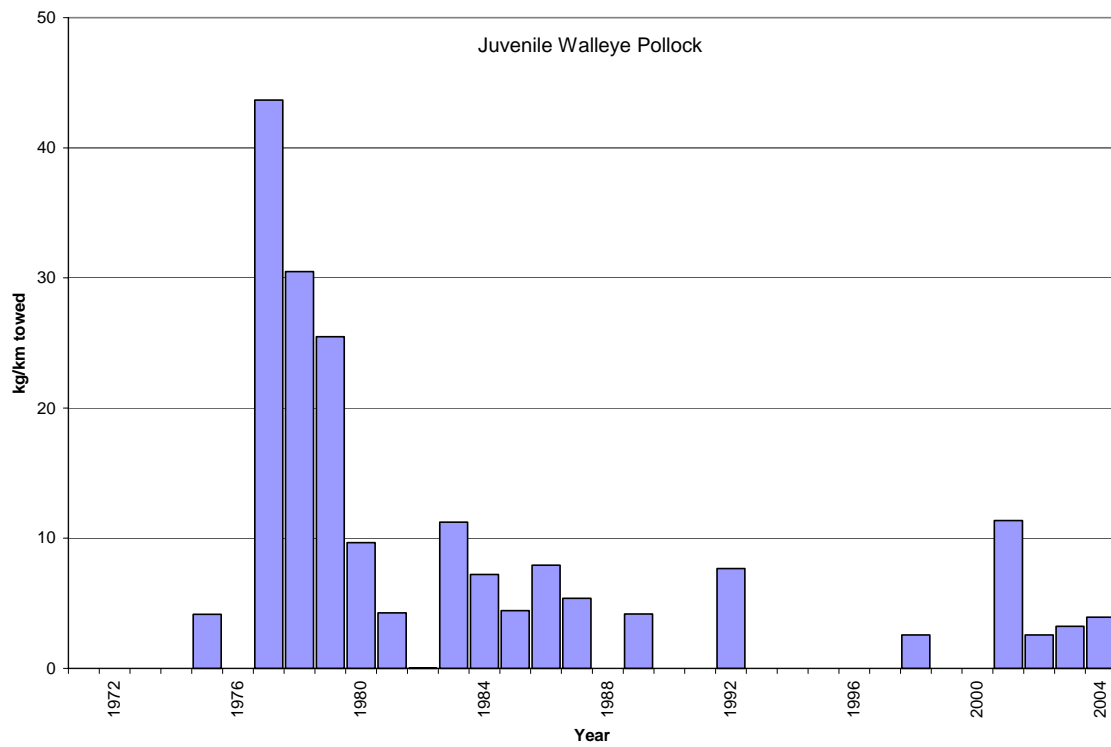
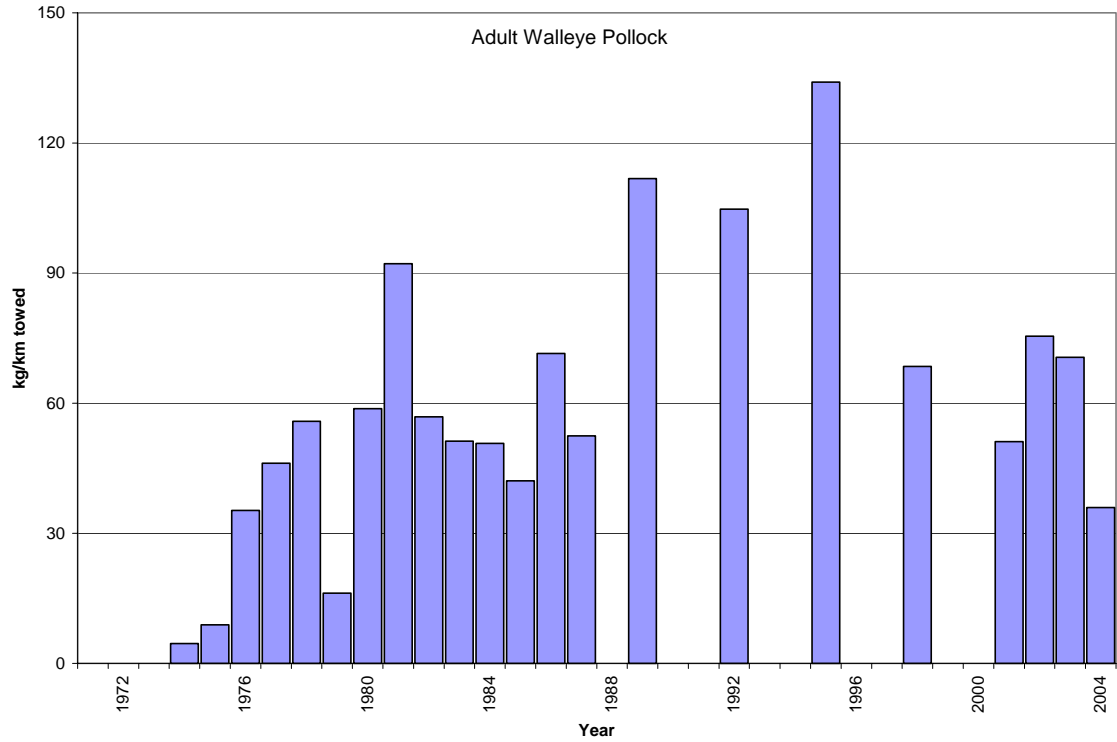


Figure 26.-Relative abundance in kg/km towed of adult walleye pollock and juvenile walleye pollock from the Westward Region small-mesh trawl survey, 1971-2004.

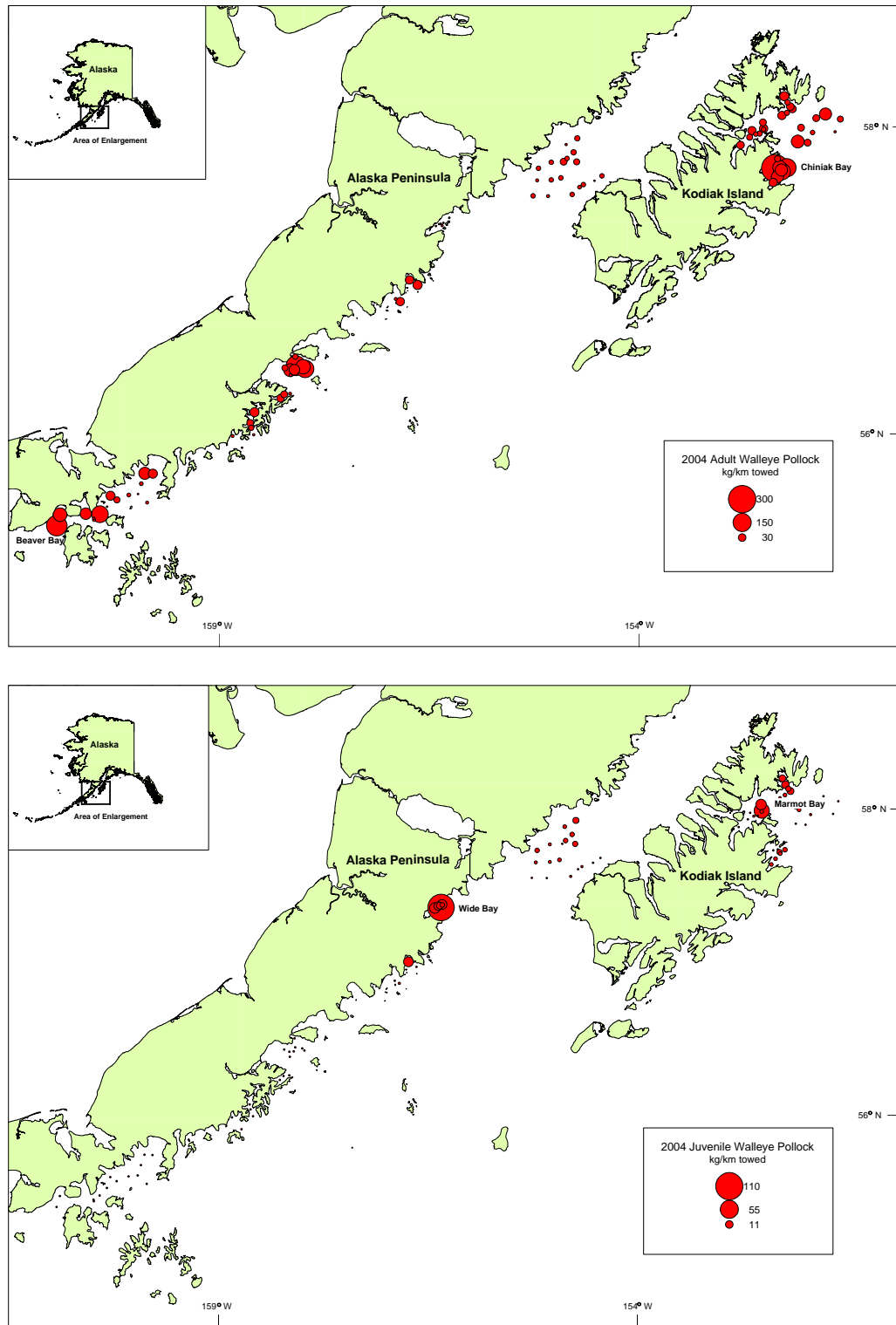


Figure 27.-Distribution and relative abundance in kg/km towed of adult walleye pollock and juvenile walleye pollock from the 2004 Westward Region small-mesh trawl survey.

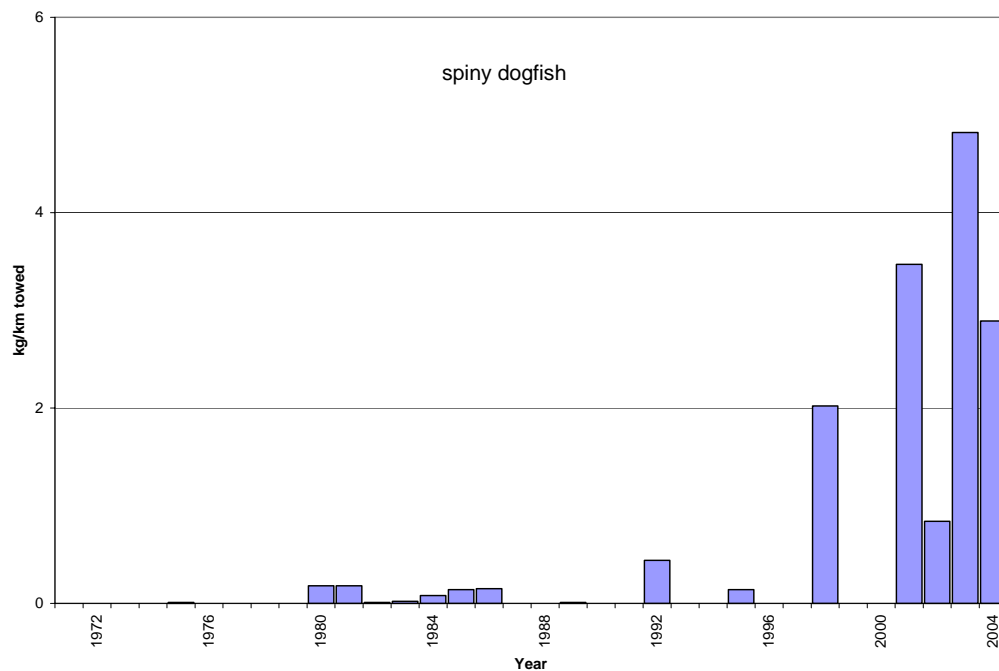


Figure 28.-Relative abundance in kg/km towed of spiny dogfish from the Westward Region small-mesh trawl survey, 1971-2004.

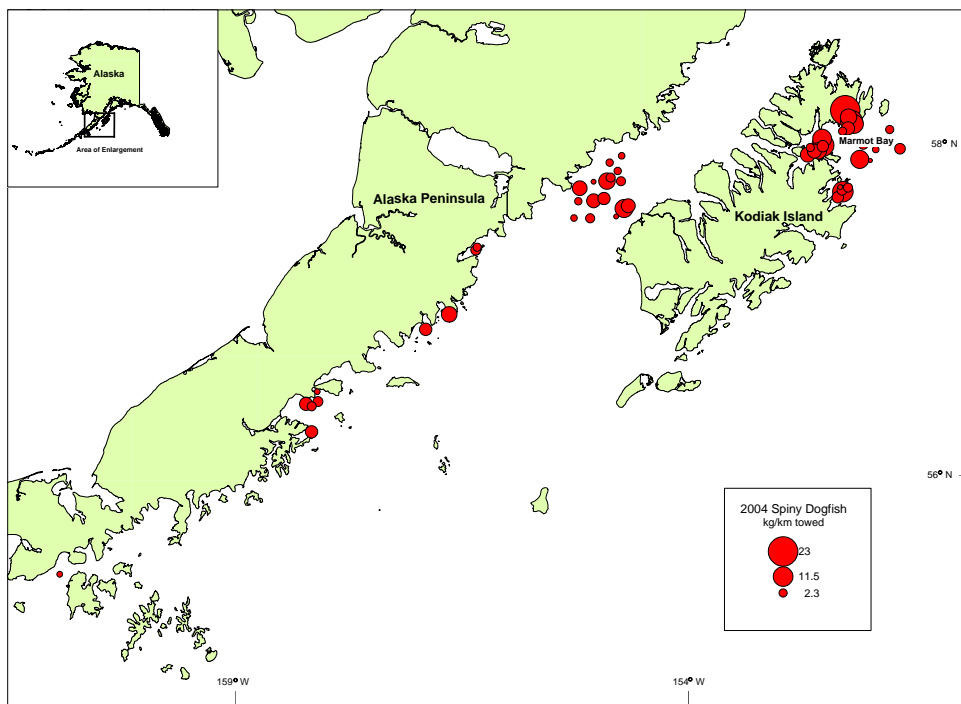


Figure 29.-Distribution and relative abundance in kg/km towed of spiny dogfish from the 2004 Westward Region small-mesh trawl survey.

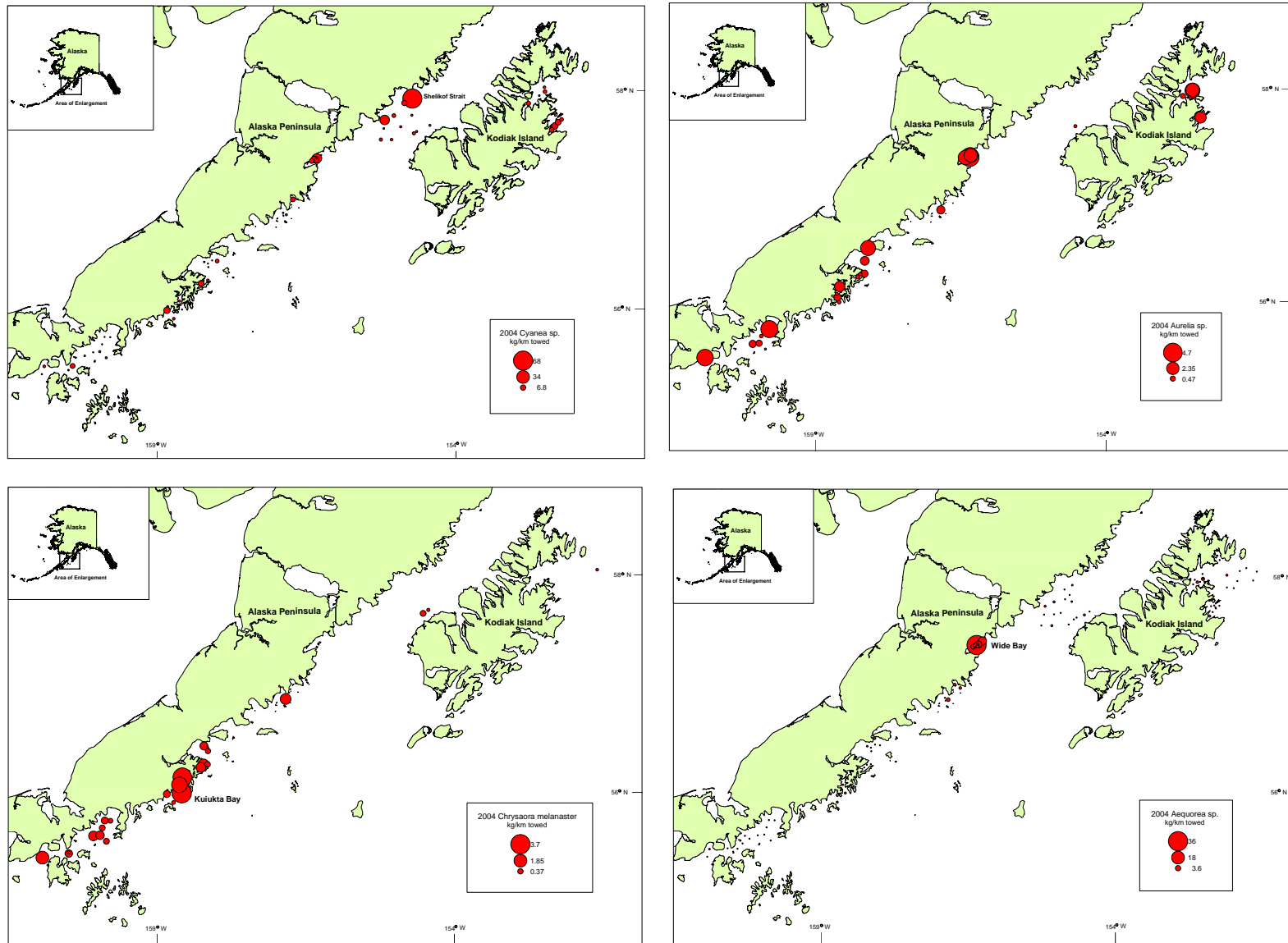


Figure 30.-Distribution and relative abundance in kg/km towed of four jellyfish groups from the 2004 Westward Region small-mesh trawl survey.

APPENDIX A. FISHING LOG AND CATCH DATA

Appendix A1.-Fishing log and catch data from the 2004 Westward Region small-mesh trawl survey.

Haul	1	2	3	4	5	6	7	8	9	10
Location	Chiniak	Chiniak	Chiniak	Chiniak	Chiniak	Chiniak	Chiniak	Chiniak	Shelikof	Shelikof
Month/Day/Year	9/27/04	9/27/04	9/27/04	9/27/04	9/28/04	9/28/04	9/28/04	9/28/04	10/1/04	10/1/04
Station	804	808	803	801	809	810	817	806	393A	392D
Longitude Start	152°21.2	152°17.9	152°21.2	152°24.3	152°18.4	152°19.7	152°14.4	152°22.8	154°26.7	154°32.0
Latitude Start	57°47.4	57°42.4	57°40.4	57°38.1	57°43.0	57°44.1	57°43.9	57°43.7	57°40.7	57°38.8
Heading, Degrees	35	231	29	41	291	135	58	124	234	225
Average Depth (m)	87	137	124	73	142	128	173	89	199	201
Distance Fished (km)	1.3	1.9	1.9	1.9	1.1	1.9	1.9	1.9	1.9	1.9
Bottom Temperature (°C)	9.3	8.8	8.9	9.4	8.8	8.8	8.8	8.9	5.4	5.4
Performance	1	1	1	1	1	1	1	1	1	1
kg/km towed										
Pollock	23.99	130.63	78.36	41.1	78.07	86.07	150.4	294.34	13.41	2.67
Pacific Cod	0	2.76	9.87	0	8.85	5.68	11.48	5.3	3.59	0
Pacific Sandfish	0.12	0	0	3.23	0.13	0	0	0	0	0
Eulachon	0	1.96	24.55	0.31	1.03	0	0	0	2.54	31.67
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	0	4.29	1.19	0	0	0.24	0	0	0	0
Herring	0.09	0	0	8.69	0	0	0	0.94	0	0
Sculpins	0	0	0	0	0	0	0.02	0	0	0
Other Forage Fish	0	0	0	0	0	0	0	0	0.15	0.22
Other Roundfish	0	0	0	0.85	0.04	0	0.02	6.64	0	0.81
TOTAL ROUND FISH	24.2	139.65	113.97	54.18	88.13	91.99	161.93	307.23	19.69	35.37
Arrowtooth Flounder	2.55	24.66	13.05	0	7.56	1.06	13.23	14.97	3.42	7.35
Flathead Sole	0.77	40.86	13.93	1.77	14.13	9.1	22.04	12.24	0.24	3.78
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0	0	0	0	0.27	0.48	0	0.26	0	0
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pacific Halibut	0	0	0	0	0	0	0	0	0	3.67
Starry Flounder	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	0	0	0	0	0	0	0	0	0
Other Flatfish	0	0	0	0	0	1.45	0	1.17	0	0
TOTAL FLATFISH	3.32	65.52	26.98	1.77	21.96	12.1	35.27	28.65	3.67	14.81
Pink Shrimp	0.06	16.04	7.37	0.06	2.03	0.39	0.81	0.29	2.75	9.79
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstripe	0	0	0	0.01	0	0	0	0.01	0	0
Sidestripe	0	0.25	0	0	0.03	0.1	0.26	0.05	0.72	1.53
Other Shrimp	0.01	0.02	0	0.02	0	0.01	0	0.04	0	0.03
TOTAL SHRIMP	0.06	16.3	7.37	0.09	2.06	0.5	1.07	0.39	3.48	11.35
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	4.05	9.28	10.98	14.93	0.26	0.77	4.03	2.18	1.99	1.76
TOTAL INVERTS	4.05	9.28	10.98	14.93	0.26	0.77	4.03	2.18	1.99	1.76
Skates	0	0	0	0	0	0	0	0	0	0
Spiny Dogfish	0	12.12	4.4	0	3.55	1.08	2.89	0	0	0
Other	0	0.1	0.44	0.31	0	1.55	0	0.65	0.03	0.43
TOTAL CATCH	31.63	242.98	164.15	71.27	115.96	107.99	205.18	339.09	90.71	63.71

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Appendix A1.-Page 2 of 10.

Haul	11	12	13	14	15	16	17	18	19	20
Location	Wide	Wide	Wide	Wide	Wide	Wide	Wide	Chiginagak	Chiginagak	Nakalilok
Month/Day/Year	10/2/04	10/2/04	10/2/04	10/2/04	10/2/04	10/3/04	10/3/04	10/3/04	10/4/04	10/4/04
Station	745	742	741	744	747	743	745	2063	2060	2053
Longitude Start	156°20.2	156°21.8	156°25.3	156°23.0	156°15.8	156°20.9	156°20.0	156°38.5	156°44.2	156°54.1
Latitude Start	57°22.4	57°21.9	57°21.0	57°21.8	57°24.2	57°21.2	57°22.2	56°57.8	56°59.8	56°52.4
Heading, Degrees	231	234	57	41	60	348	15	159	179	98
Average Depth (m)	62	58	54	60	69	64	64	149	85	137
Distance Fished (km)	1.9	1.9	1.9	1.9	1.5	1.1	1.1	1.9	1.9	1.9
Bottom Temperature (°C)	9.8	9.8	9.9	9.8	9.5	9.8	9.7	7.8	9.7	6.6
Performance	1	1	1	1	1	1	1	1	1	1
kg/km towed										
Pollock	19.23	12.22	22.39	13.6	0.61	107.51	4.93	47.63	55	27.69
Pacific Cod	0	4.53	5.54	0	0	12.78	2.45	3.14	3	11.4
Pacific Sandfish	86.11	18.47	30.63	18.41	4.86	29.94	47.05	0	0.12	0
Eulachon	0	0	0	0	0	0	0	43.73	14.59	67.96
Capelin	0	0.02	0	0	0.01	0.11	0	0.02	0	0
Rockfish	0	0	0	0	0	0	0	0	0	0
Herring	1.03	1.3	2.74	1.11	0.37	1.57	1.03	0	0.3	0
Sculpins	0	1.15	0	0	0	0	0	0.02	0	0
Other Forage Fish	0.14	0.25	0	0.11	0	0.35	0.16	0.02	0	0.03
Other Roundfish	1.46	2.62	2.06	0	0.08	6.55	0.35	0.16	0	2.17
TOTAL ROUNDFISH	107.97	40.55	63.37	33.24	5.92	158.81	55.98	94.72	73.01	109.25
Arrowtooth Flounder	0	0	0	0	0	0	0	10.15	0.81	3.78
Flathead Sole	0.05	0.52	0.02	0	0	0	0.03	0.62	0.23	3.78
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0	0	0	0	0	0	0	0	0	0
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pacific Halibut	0	0	0	0	0	0	0	0	0	1.15
Starry Flounder	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	2.88	0	0	0	0	0	0	0	0
Other Flatfish	0	0	0	0	0	0	1.47	0	0	0
TOTAL FLATFISH	0.05	3.4	0.02	0	0	0	1.5	10.78	1.04	8.7
Pink Shrimp	207.13	58.23	13.35	33.55	0.02	411.58	54.73	33.67	8.54	28.77
Humpy Shrimp	35.89	36.78	33.66	2.09	0.02	58.69	0.26	0	0	0
Coonstripe	0	0.15	0.73	0.02	0	0.79	0	0	0	0
Sidestripe	0	0	0.15	0	0	0	0	11.34	0	1.32
Other Shrimp	0.07	0.05	0.47	0.08	0	0	0.26	0.43	0.01	0.12
TOTAL SHRIMP	243.08	95.21	48.36	35.74	0.04	471.05	55.25	45.44	8.55	30.2
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	23.66	46.43	14.99	13.04	8.32	12.16	9.03	1.12	6.69	4.33
TOTAL INVERTS	23.66	46.43	14.99	13.04	8.32	12.16	9.03	1.12	6.69	4.33
Skates	0	0	0	0	0	0	0	0	0	0
Spiny Dogfish	0	0	0	0	0	3.55	2.61	7.61	0	5.16
Other	1.04	0.14	1.77	0.06	0.67	14.97	10.62	0.16	0.35	0.03
TOTAL CATCH	375.81	185.75	128.51	82.07	14.96	660.55	134.99	159.83	89.63	157.67

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Appendix A1.-Page 3 of 10.

Haul	21	22	23	24	25	26	27	28	29	30
Location	Nakalilok	Chignik	Chignik	Chignik	Chignik	Chignik	Chignik	Chignik	Chignik	Chignik
Month/Day/Year	10/4/04	10/5/04	10/5/04	10/5/04	10/5/04	10/5/04	10/5/04	10/6/04	10/6/04	10/6/04
Station	2052	1940	1935	1932	1917	1922	1920	1924	1910	1901
Longitude Start	156°50.8	158°05.8	158°05.3	158°00.3	157°58.8	158°09.5	158°06.5	158°13.3	158°09.2	158°16.4
Latitude Start	56°51.4	56°29.8	56°26.2	56°25.8	56°24.9	56°24.4	56°24.6	56°25.3	56°22.5	56°13.4
Heading, Degrees	328	123	94	134	270	79	90	105	48	31
Average Depth (m)	137	109	137	188	192	162	195	144	137	74
Distance Fished (km)	1.5	1.9	1.9	1.9	0.9	1.9	1.9	1.9	1.9	1.9
Bottom Temperature (°C)	6.5	8.1	6.4	6.3	6.2	6.3	6.1	6.5	6.4	9.2
Performance	1	1	1	1	1	1	1	1	1	1
kg/km towed										
Pollock	36.91	17.66	167.79	101.53	134.55	76.87	54.05	22.92	8.58	30.86
Pacific Cod	1.91	5.16	0	3.71	0	1.94	1.77	0	0	0
Pacific Sandfish	0	0	0	0	0	0	0	0	0	0.21
Eulachon	134.61	21.98	4.73	0.56	0.16	14.63	0.43	7.82	19.73	5.87
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	0	0	0	0	0	0.65	1.05	0	0	0.16
Herring	0	0	0	0	0	0	0	0	0	0.07
Sculpins	0	0	0	0	0.81	0	0.07	0	0	0
Other Forage Fish	0	0	0	0.7	3.51	0.21	1.84	0	0	0
Other Roundfish	0	0	0	2.38	2.54	0	2.46	0	0	0.07
TOTAL ROUND FISH	173.43	44.8	172.52	108.88	141.57	94.3	61.67	30.74	28.3	37.24
Arrowtooth Flounder	3.29	14.08	10.15	18.77	30	12.32	57.59	38.73	2.91	0
Flathead Sole	2.68	8.28	5.42	13.44	29.73	22.4	47.1	25.5	3.34	0.74
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0	0	0	0	0	0	1.28	0	0	0
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pacific Halibut	1.21	2.85	9.42	0	0	0.8	0	0.2	0	0
Starry Flounder	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	0	0	0	0	0	0	0	0	0
Other Flatfish	0	0	0	0	0	0	0	0	0	0
TOTAL FLATFISH	7.18	25.21	24.99	32.21	59.73	35.53	105.97	64.44	6.25	0.74
Pink Shrimp	7.46	2.72	12.74	40.58	115.97	45.21	111.92	47.83	8.1	0.08
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstripe	0	0	0	0	0	0	0	0	0	0
Sidestripe	0.56	0	0.58	2.51	11.14	0.27	7.56	0	0	0
Other Shrimp	0.11	0	0.08	0.04	0.19	0.24	0.11	0.1	0.09	0
TOTAL SHRIMP	8.13	2.72	13.4	43.14	127.29	45.72	119.59	47.94	8.19	0.08
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	5.62	4.73	0.65	3.67	9.68	0.74	0.03	2.37	1.88	10.39
TOTAL INVERTS	5.62	4.73	0.65	3.67	9.68	0.74	0.03	2.37	1.88	10.39
Skates	0	0	0	0	0	0	0	0	0	0
Spiny Dogfish	0	1.32	3.27	0	0	2.94	0	5.62	0	0
Other	0.02	0.05	0.08	0	0.81	1.12	0	0.09	0.73	0.14
TOTAL CATCH	194.38	78.83	214.9	187.9	339.09	180.35	287.26	151.19	45.36	48.6

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Haul	31	32	33	34	35	36	37	38	39	40
Location	Chignik	Chignik	Kuiukta	Kuiukta	Kuiukta	Kuiukta	Mitrofanina	Mitrofanina	Stepovak	Stepovak
Month/Day/Year	10/6/04	10/6/04	10/7/04	10/7/04	10/7/04	10/7/04	10/7/04	10/7/04	10/8/04	10/8/04
Station	1903	1909	1970	1061	1082	1090	1972	1971	105	74
Longitude Start	158°13.8	158°09.6	158°35.0	158°38.0	158°37.3	158°35.6	158°43.8	158°50.7	159°51.7	159°58.2
Latitude Start	56°14.9	56°15.2	56°07.9	56°03.7	56°01.8	55°59.1	55°54.0	55°58.6	55°32.5	55°35.8
Heading, Degrees	53	65	225	186	158	348	124	184	285	301
Average Depth (m)	74	126	159	170	173	124	137	126	170	155
Distance Fished (km)	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Bottom Temperature (°C)	9.1	8.8	6.4	6.9	6.7	8.2	7.6	7.6	5.2	5.8
Performance	1	1	1	1	1	1	1	1	1	1
kg/km towed										
Pollock	26.67	7.4	43.14	25.41	17.89	3.45	1.35	6.97	6.09	2.19
Pacific Cod	0	3.26	7.34	17.61	11.9	0	0	0	1.53	0
Pacific Sandfish	0.11	0	0	0	0	0	0	0	0	0
Eulachon	0.43	37.82	13.81	6.8	1.52	1.81	52.14	64.33	16.38	20.79
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	0	0	0.38	0	0	0	2.35	0	0	0
Herring	0	0	0	0	0	0	0	0	0	0
Sculpins	0	0.05	5.29	0	0	0	0	0	0	0
Other Forage Fish	0	0	0.43	0.56	0.43	0	0	0	0	0
Other Roundfish	0	0	0	0	0	0	0	0	0	0
TOTAL ROUNDFISH	27.22	48.54	70.39	50.38	31.73	5.26	55.83	71.3	24	22.98
Arrowtooth Flounder	0	7.4	27.93	23.37	7.48	0.35	4.31	2.41	2.08	1.12
Flathead Sole	0.11	11.88	27.5	35.12	20.81	1.4	2.49	3.13	2.04	2.24
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0	0	0	0	0	0	0	0	0	0.2
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pacific Halibut	0	0	0	8.73	0	0	0	0	0	0
Starry Flounder	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	0	0	0	0	0	0	0	0	0
Other Flatfish	0	0	0	0	0	0	0	0	0	0
TOTAL FLATFISH	0.11	19.28	55.44	67.23	28.3	1.75	6.79	5.54	4.12	3.57
Pink Shrimp	0.01	30.97	37.87	39.32	71.9	0.58	1.36	0.22	8.36	1.24
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstripe	0	0	0	0	0	0	0	0	0	0
Sidestripe	0	0	0.8	7.63	3.68	0.01	0	0	0	0
Other Shrimp	0	0.08	0.16	0.23	0	0.01	0.08	0.01	0.25	0.03
TOTAL SHRIMP	0.01	31.05	38.83	47.18	75.58	0.6	1.44	0.23	8.6	1.27
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	2.48	6.93	5.76	4.7	2.49	4.93	2.83	11.49	2.11	3.4
TOTAL INVERTS	2.48	6.93	5.76	4.7	2.49	4.93	2.83	11.49	2.11	3.4
Skates	0	0	0	0	0	0	0	0	0	0
Spiny Dogfish	0	5.13	0	0	0	0	0	0	0	0
Other	0.22	0.31	0.22	0.06	0.12	0.24	0.07	0	0.04	0.1
TOTAL CATCH	30.04	111.23	170.63	169.55	138.23	12.79	66.96	88.55	38.88	31.32

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Haul	41	42	43	44	45	46	47	48	49	50
Location	Stepovak	Stepovak	Stepovak	Unga	Unga	Unga	Unga	Unga	Mitrofanina	Unga
Month/Day/Year	10/8/04	10/8/04	10/8/04	10/8/04	10/9/04	10/9/04	10/9/04	10/9/04	10/9/04	10/9/04
Station	51	28	36	89	92	111	131	151	173	174
Longitude Start	159°55.9	159°53.4	159°47.6	160°04.8	160°17.9	160°13.3	160°20.3	160°25.5	160.29.7	160°29.9
Latitude Start	55°39.9	55°43.9	55°43.8	55°35.4	55°35.1	55°33.5	55°30.9	55°27.9	55°25.7	55°26.3
Heading, Degrees	22	35	180	329	150	291	47	40	51	264
Average Depth (m)	124	117	124	162	182	182	171	173	128	137
Distance Fished (km)	1.9	1.9	1.3	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Bottom Temperature (°C)	6.9	7.3	6.4	5.2	5.2	5.2	5.7	5.3	6.6	6.2
Performance	1	1	1	1	1	1	1	1	1	1
	kg/km towed									
Pollock	11.26	76.52	41.6	7.89	44.71	22.75	0.26	122.83	6.04	4.99
Pacific Cod	0	0	0	0	4.71	0	1.53	16.3	0	0
Pacific Sandfish	0	0	0	0	0	0	0	0	0	0
Eulachon	4.02	13.88	30.59	18.98	15.45	9.79	31.76	51.93	2.35	17.93
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	0	0	0.12	0	0.35	0	0.16	0	0	0
Herring	0	0	0	0	0	0	0	0	0	0
Sculpins	0	0.01	0	0	0	1.14	0	0	0	0
Other Forage Fish	0	0	0	0	0	0.1	0	0	0	0
Other Roundfish	0	0	0	0	2.28	0.47	0	0	0	0
TOTAL ROUNDFISH	15.28	90.41	72.31	26.87	67.5	34.25	33.71	191.06	8.39	22.92
Arrowtooth Flounder	0	9.43	0	2.94	17.47	10.62	6.25	11.91	0	9.37
Flathead Sole	0	10.28	1.18	5.07	23.04	12.85	6.25	17.98	1.35	1.59
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0	0.85	0	0	0	0	0	0	0	0.49
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pacific Halibut	0	0	0	0	0.97	5.07	1.94	0	0	0
Starry Flounder	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	0	0	0	0	0	0	0	0	0
Other Flatfish	0	0	0	0	0	0	0	0	0	0
TOTAL FLATFISH	0	20.56	1.18	8.02	41.48	28.54	14.43	29.89	1.35	11.45
Pink Shrimp	0.01	0	0.01	6.14	24.81	21.35	5.4	43.37	0.05	0.05
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstripe	0	0	0	0	0	0	0	0	0	0
Sidestripe	0	0	0	0.01	0.4	0.12	0	0.15	0	0
Other Shrimp	0	0.01	0.01	0.14	0.37	0.09	0.02	0.04	0	0
TOTAL SHRIMP	0.01	0.01	0.02	6.29	25.57	21.55	5.42	43.57	0.05	0.05
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	1.14	0.96	5.02	2.8	0.43	0.97	0.26	6.54	1.42	0.23
TOTAL INVERTS	1.14	0.96	5.02	2.8	0.43	0.97	0.26	6.54	1.42	0.23
Skates	0	0	0	0	0	0	0	0	0	0
Spiny Dogfish	0	0	0	0	0	0	0	0	0	0
Other	0.16	0.42	0.15	0.3	0	0	0.18	0	0	0
TOTAL CATCH	16.6	138.23	78.68	44.28	134.99	85.31	53.99	271.06	11.21	34.64

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Haul	51	52	53	54	55	56	57	58	59	60
Location	Unga	Beaver	Beaver	Shelikof	Shelikof	Shelikof	Shelikof	Shelikof	Shelikof	Shelikof
Month/Day/Year	10/9/04	10/10/04	10/10/04	10/13/04	10/13/04	10/14/04	10/14/04	10/14/04	10/14/04	10/14/04
Station	152	225	177	416B	391D	364A	334D	335A	305A	304C
Longitude Start	160°35.6	160°56.3	160°54.0	154°42.7	154°39.9	154°44.8	154°51.6	154°47.0	154°44.3	154°52.3
Latitude Start	55°28.1	55°23.4	55°27.7	57°36.3	57°37.3	57°46.2	57°47.6	57°50.0	57°55.5	57°53.0
Heading, Degrees	87	8	201	62	15	214	29	54	222	230
Average Depth (m)	128	107	91	228	223	230	265	268	252	250
Distance Fished (km)	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Bottom Temperature (°C)	7.5	9	9.5	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Performance	1	1	1	1	1	1	1	1	1	1
kg/km towed										
Pollock	68	179.56	88.83	9.8	14.15	25.08	16.8	21.03	26.06	8.37
Pacific Cod	12.34	2.9	3.5	0	5.05	0	0	1.78	3.71	2.43
Pacific Sandfish	0	0	0	0	0	0	0	0	0	0
Eulachon	45.03	0	0	1.23	0.57	0.19	0.13	0.24	0	0
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	0	0	0	0	0	0	1.67	0	0.84	0
Herring	0	0	0	0	0	0.01	0	0	0	0
Sculpins	0	0	0	0	0	0	0	0	0	0
Other Forage Fish	0	0	0.01	0.15	0.08	0.06	0.02	0.07	0	0.12
Other Roundfish	0	0	0	0.04	1.23	0	0.02	0.01	0	0.01
TOTAL ROUNDFISH	125.37	182.46	92.34	11.22	21.08	25.33	18.63	23.12	30.61	10.94
Arrowtooth Flounder	6.3	0	0	11.87	13.8	9.31	1.51	1.47	6.36	1.96
Flathead Sole	0	0	0.48	0.33	1.08	0.43	0	0.53	0	0.94
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0	0	0	0	0	0.08	0.01	0	0	0
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pacific Halibut	0	0	0	0	6.64	0	0	0	0	2.64
Starry Flounder	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	0	0	0	0	0	0	0	0	0
Other Flatfish	0	0	0	0	0	0	0	0	0	0
TOTAL FLATFISH	6.3	0	0.48	12.2	21.52	9.83	1.52	2	6.36	5.54
Pink Shrimp	0.03	0.4	0	2.35	2.3	4.49	4.92	1.47	1.78	4.71
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstripe	0	0	0	0	0	0	0	0	0	0
Sidestripe	0	0	0	0.98	3.07	3.14	4.89	3.15	1.22	2.15
Other Shrimp	0	0.01	0	0.63	0.14	0.63	0.88	1.04	1.01	1.05
TOTAL SHRIMP	0.03	0.41	0	3.97	5.51	8.26	10.69	5.66	4.01	7.91
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	0.05	2.36	6.88	3.45	2.59	2.15	7.95	1.69	75.17	9.33
TOTAL INVERTS	0.05	2.36	6.88	3.45	2.59	2.15	7.95	1.69	75.17	9.33
Skates	0	0	0	7.37	0	0	0	0	0	0
Spiny Dogfish	0	1.35	0	9.85	6.05	2.75	2.89	2.08	1.57	1.92
Other	0	2.4	0.72	0.53	0.16	0.05	0.06	0	0	0
TOTAL CATCH	131.75	188.98	100.43	48.6	56.91	48.38	61.56	65.87	194.38	35.64

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Haul	61	62	63	64	65	66	67	68	69	70
Location	Shelikof	Shelikof	Shelikof	Shelikof	Shelikof	Shelikof	Shelikof	Shelikof	Shelikof	Marmot Is
Month/Day/Year	10/14/04	10/15/04	10/15/04	10/14/04	10/15/04	10/15/04	10/15/04	10/16/04	10/16/04	10/20/04
Station	363A	362A	361C	389C	415D	414C	413C	388C	390A	20
Longitude Start	154°54.1	155°02.9	155°12.0	155°02.9	154°48.0	155°05.1	155°15.9	155°13.0	154°56.0	151°56.1
Latitude Start	57°46.3	57°46.0	57°43.7	57°39.1	57°33.4	57°32.8	57°32.8	57°38.9	57°39.9	57°57.7
Heading, Degrees	230	220	212	208	198	367	5	230	60	229
Average Depth (m)	268	292	288	252	246	239	270	288	232	182
Distance Fished (km)	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Bottom Temperature (°C)	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	6.6
Performance	1	1	1	1	1	1	1	1	1	1
kg/km towed										
Pollock	26.53	13.77	18.57	14.85	13.39	8.18	12.75	7.61	15.15	13.23
Pacific Cod	0	4.02	0	0	1.55	1.38	8.43	0	0.01	19.7
Pacific Sandfish	0	0	0	0	0	0	0	0	0	0
Eulachon	0	0.28	0.18	0.54	2.08	0.58	0	0.05	0.54	2.91
Capelin	0	0	0	0	0	0	0	0.01	0	0.05
Rockfish	0.05	0	0.86	0	0	0	7.72	0	9.37	0.59
Herring	0	0	0	0	0	0	0	0	0	0
Sculpins	0	0	0	0	0	0	0.23	0	0	0
Other Forage Fish	2.61	1.2	0.04	0.09	0.05	0	1.1	0.22	0.67	0
Other Roundfish	9.44	0.04	0.01	0.01	0.07	0.04	7.38	0.01	0.27	0.13
TOTAL ROUND FISH	38.64	19.31	19.66	15.5	17.14	10.19	37.62	7.9	26.01	36.62
Arrowtooth Flounder	69.89	4.05	1.68	1.78	7.07	4.8	18.62	1.27	9.8	17.79
Flathead Sole	0	0.56	0	0	0	0	0.39	0	0.24	4.05
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0.24	0	0	0	0	0.01	0.09	0	0.27	0
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pacific Halibut	0	4.07	0	0	0	0	0	0	0	0
Starry Flounder	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	0	0	0	0	0	0	0	0	0
Other Flatfish	0	0	0	0	0	0	0	0	0	0
TOTAL FLATFISH	70.13	8.67	1.68	1.78	7.07	4.81	19.11	1.27	10.31	21.84
Pink Shrimp	25.96	2.76	0.31	1.41	1.16	6.12	5.19	4.48	3.73	10.81
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstripe	0	0	0	0	0	0	0	0	0	0
Sidestripe	5.04	9.72	0.95	1.33	1.66	2.08	19.63	2.58	5.41	5.49
Other Shrimp	0.27	0.71	0.22	0.23	0.05	0.16	0.22	0.85	0.33	0.03
TOTAL SHRIMP	31.28	13.19	1.49	2.97	2.86	8.36	25.04	7.91	9.47	16.34
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	175.75	7.86	24.29	5.54	0.74	2.94	6.35	2.94	2.67	0.02
TOTAL INVERTS	175.75	7.86	24.29	5.54	0.74	2.94	6.35	2.94	2.67	0.02
Skates	81.56	4.29	0	0.04	0	0	0	0	0	0
Spiny Dogfish	7.99	1.08	6.88	6.24	1.08	2.81	1.48	2.21	5.21	1.54
Other	0.71	0.67	0	0	0	0.05	0.02	0	0	0.32
TOTAL CATCH	406.05	55.08	54	32.06	28.9	29.16	89.63	22.23	53.68	76.67

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Haul	71	72	73	74	75	76	77	78	79	80
Location	Marmot Is	Marmot Is	Marmot Is	Marmot Is	Marmot Is	Marmot Is	Marmot Is	Marmot Is	Marmot Is	Marmot Is
Month/Day/Year	10/20/04	10/20/04	10/20/04	10/20/04	10/21/04	10/21/04	10/21/04	10/21/04	10/21/04	10/21/04
Station	44	48	31	17	14	109	4	106	510	497
Longitude Start	151°40.0	151°36.3	151°46.9	151°53.6	151°59.7	152°06.8	152°04.4	152°06.7	152°10.5	152°12.1
Latitude Start	57°58.0	58°03.0	58°05.0	58°03.4	57°53.7	57°54.2	57°59.6	58°01.0	58°07.0	58°07.9
Heading, Degrees	336	338	252	249	307	302	317	314	142	151
Average Depth (m)	100	146	135	135	155	120	173	155	195	182
Distance Fished (km)	1.9	1.9	1.9	1.9	1.9	1.7	1.9	1.9	1.9	1.9
Bottom Temperature (°C)	7.4	6.8	6.7	6.7	7	7.1	6.6	6.7	6.7	6.7
Performance	1	1	1	1	1	1	1	1	1	1
kg/km towed										
Pollock	5.1	23.05	75.97	29.37	28.9	84.15	27.27	5.97	44.29	50.16
Pacific Cod	3.29	0	1.95	17.28	1.18	4.64	37.48	0	7.92	38.49
Pacific Sandfish	0	0	0	0	0	0	0	0	0	0
Eulachon	0	0.49	0	0	0.25	0.12	10.33	67.91	5.61	5.93
Capelin	0	0	0	0.01	0	0	0.02	0	0	0.05
Rockfish	0	0	0.08	0.97	0	0	0	0	0	0
Herring	0	0	0	0	0	0	0	0	0	0
Sculpins	0	0	0	0	0	0	0	0	0	0
Other Forage Fish	0	0	0	0	0	0	0	0	0.8	0.13
Other Roundfish	0	0	0	0	0	0	0	0	0.21	0.02
TOTAL ROUNDFISH	8.39	23.54	78	47.63	30.33	88.91	75.11	73.88	58.84	94.78
Arrowtooth Flounder	8.32	2	1.07	9.53	9	0.18	0.43	0	1	15.22
Flathead Sole	1.62	4.16	0.99	3.35	0.59	0.91	36.03	7.19	123.46	103.68
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0	0	0	0.57	0	0	0	0	0	0.02
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pacific Halibut	0	0	0	0	5.56	0	0	0	0	5.69
Starry Flounder	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	0	0	0	0	0	0	0	0	0
Other Flatfish	0	0	0	0	0	0	0	0	0	0
TOTAL FLATFISH	9.94	6.16	2.05	13.44	15.14	1.09	36.46	7.19	124.47	124.6
Pink Shrimp	0.04	0.52	1.57	0.18	10.75	2.87	38.27	9.15	77.74	76.78
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstripe	0	0	0	0	0	0	0	0	0	0
Sidestripe	0.01	0	0	0	1.19	0	5.48	0.24	2.63	7.38
Other Shrimp	0	0	0	0.02	0	0.08	0.03	0	0	0.04
TOTAL SHRIMP	0.06	0.52	1.57	0.2	11.94	2.95	43.78	9.39	80.37	84.21
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	0.56	0.19	0.02	0.17	0.1	0.55	0	0.61	0.11	0.09
TOTAL INVERTS	0.56	0.19	0.02	0.17	0.1	0.55	0	0.61	0.11	0.09
Skates	0	0	0	0	0	0	0	5.03	0	0
Spiny Dogfish	4.1	0	2.59	0	0.76	9.6	3.4	0	10.48	13.55
Other	0	0	0	0.11	0.04	0.09	0	0	0.03	0.26
TOTAL CATCH	23.05	30.4	84.23	61.55	58.32	103.19	158.75	96.11	274.3	317.5

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Haul	81	82	83	84	85	86	87	88	89	90
Location	Marmot Is	Marmot Is	Marmot Is	Marmot Is	Marmot	Marmot	Marmot	Marmot	Marmot	Marmot
Month/Day/Year	10/22/04	10/22/04	10/22/04	10/22/04	10/22/04	10/22/04	10/22/04	10/22/04	10/23/04	10/23/04
Station	491	494	478	467	422	413	409	415	402	407
Longitude Start	152°16.3	152°14.1	152°14.5	152°18.1	152°31.6	152°31.2	152°39.4	152°36.8	152°47.6	152°41.1
Latitude Start	58°12.0	58°09.5	58°05.5	58°04.4	58°01.7	57°59.0	57°58.5	57°57.1	57°52.8	57°55.9
Heading, Degrees	141	161	234	234	75	32	208	275	44	232
Average Depth (m)	159	173	170	177	199	133	118	129	91	118
Distance Fished (km)	1.9	1.9	1.9	1.7	1.9	1.3	1.1	1.9	1.5	1.9
Bottom Temperature (°C)	6.9	6.8	6.7	6.7	6.7	7	7.1	6.9	7.4	7.4
Performance	1	1	1	1	1	1	1	1	1	1
	kg/km towed									
Pollock	53.45	27.91	23.54	41.05	47.89	14.67	39.97	16.48	33.71	19.95
Pacific Cod	19.58	19.57	18.99	12.11	19.85	0	2.55	6.85	1.05	8.13
Pacific Sandfish	0	0	0	0	0	0	0	0	0	0
Eulachon	8.05	7.93	12.48	17.9	3.67	27.33	46.06	117.05	0	40.76
Capelin	0	0.03	0.03	0	0	0	0	0	0	0
Rockfish	0	0	0.62	0	0	0	0	0	0	0.46
Herring	0	0	0	0	0	0.05	0	0	0	0
Sculpins	0	0.01	0	0	0	0	0	0	0	0
Other Forage Fish	0.28	0.22	0	0	0.16	0	0	0.69	0	0
Other Roundfish	0	0.04	0	0	3.43	0.05	0	0	0.01	0
TOTAL ROUNDFISH	81.35	55.7	55.66	71.05	75.01	42.1	88.58	141.06	34.77	69.31
Arrowtooth Flounder	21.66	19.55	10.7	3.82	17.76	9.06	5.45	6.87	6.55	12.23
Flathead Sole	95.37	117.52	39.7	24.82	28.42	0.02	5.13	10.64	0.3	18.64
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0.83	4.02	2.73	0	1.1	0.01	0	0	0	0
Dover Sole	0	0	0	1.31	0	0	0	0	0	0
Pacific Halibut	0	8.36	0	8.47	0	0	0	0	0	2.53
Starry Flounder	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	0	0	0	0	0	0	0	0	0
Other Flatfish	0	0	0	0	0	0	0	0	0	0
TOTAL FLATFISH	117.86	149.45	53.14	38.42	47.28	9.08	10.58	17.51	6.85	33.41
Pink Shrimp	38.41	40.81	54.52	70.62	95.44	45.23	9.82	58.7	0.03	6.24
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstripe	0	0	0	0	0	0	0	0	0	0
Sidestripe	1.01	5.64	0.34	0.69	1.82	0.51	0	0.21	0	0.01
Other Shrimp	0.42	1.44	0.06	0.04	0	0	0.01	0.02	0	0.16
TOTAL SHRIMP	39.84	47.9	54.92	71.35	97.26	45.74	9.83	58.92	0.03	6.41
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	0.42	0.07	0	0	2.08	4.76	0.24	1.83	4.84	1.06
TOTAL INVERTS	0.42	0.07	0	0	2.08	4.76	0.24	1.83	4.84	1.06
Skates	0	1.18	0	0	0.03	0	0	0	0	0
Spiny Dogfish	22.89	8.05	5.78	2.64	10.36	4.47	2.34	6.16	0	7.07
Other	0.05	0.07	0.05	0.12	0.17	0.28	0.02	0.23	0	0.46
TOTAL CATCH	262.42	262.42	169.55	183.59	232.18	106.45	111.59	225.7	46.49	117.71

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Haul	91	92
Location	Marmot	Marmot
Month/Day/Year	10/23/04	10/23/04
Station	426	441
Longitude Start	152°34.0	152°31.1
Latitude Start	57°57.3	57°59.3
Heading, Degrees	43	25
Average Depth (m)	146	164
Distance Fished (km)	1.9	1.9
Bottom Temperature (°C)	6.8	6.8
Performance	1	1
	<hr/>	
	kg/km towed	
Pollock	16.22	77.56
Pacific Cod	11.33	10.77
Pacific Sandfish	0	0
Eulachon	68.33	11.56
Capelin	0	0
Rockfish	0.73	0.78
Herring	0	0
Sculpins	0	0.01
Other Forage Fish	0	0.42
Other Roundfish	0	0.06
TOTAL ROUND FISH	96.61	101.16
Arrowtooth Flounder	35.45	18.47
Flathead Sole	32.58	34.13
Rock Sole	0	0
Rex Sole	0	0
Dover Sole	0	0
Pacific Halibut	0	0
Starry Flounder	0	0
Yellowfin Sole	0	0
Other Flatfish	0	0
TOTAL FLATFISH	68.04	52.6
Pink Shrimp	66.1	53.84
Humpy Shrimp	0	0
Coonstripe	0	0
Sidestripe	1.9	3.05
Other Shrimp	0.05	0.08
TOTAL SHRIMP	68.04	56.98
Euphasiid	0	0
Other Inverts	0.09	6.5
TOTAL INVERTS	0.09	6.5
Skates	0	0
Spiny Dogfish	8.02	13.82
Other	0.02	0.04
TOTAL CATCH	240.82	231.1

APPENDIX B. FISH LENGTHS

Appendix B1.-Adult walleye pollock lengths from the 2004 Westward Region small-mesh trawl survey.

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Wide Bay	Shelikof Strait	Mitrofanina Island	Stepovak Bay	Unga Strait	Chignik Bay	Beaver Bay	Kuiu Bay	Nakalilik Bay	Chignik Bay	Total
16	0	0	0	0	2	0	0	0	0	0	2	0	0	4
17	0	0	0	0	7	0	1	0	0	0	2	0	0	10
18	0	0	0	0	17	0	2	2	2	0	7	0	0	30
19	0	0	0	0	58	0	2	3	5	0	21	4	3	96
20	0	0	0	3	88	0	4	6	20	0	25	22	14	182
21	0	0	1	3	52	1	3	5	21	0	13	16	22	137
22	0	0	0	7	25	1	4	8	17	0	6	31	24	123
23	1	0	0	9	8	0	2	6	16	0	3	14	14	73
24	1	1	0	6	4	1	3	2	0	0	1	6	15	40
25	2	1	0	6	2	0	0	0	2	0	0	2	6	21
26	3	0	2	2	3	1	0	0	0	0	0	1	1	13
27	1	1	2	0	2	0	0	0	0	0	0	0	0	6
28	5	0	1	1	4	0	0	0	0	0	0	0	0	11
29	1	1	0	0	7	0	0	0	0	0	0	0	0	9
30	0	0	0	0	9	0	0	0	0	0	0	0	0	9
31	0	0	4	0	10	0	0	0	0	0	0	0	0	14
32	0	0	1	0	4	0	0	0	0	0	0	0	0	5
33	1	1	3	0	9	0	0	0	0	0	0	0	1	15
34	4	1	9	0	2	0	0	0	0	0	0	0	0	16
35	0	0	14	0	2	0	0	0	0	0	1	0	1	18
36	2	0	15	0	6	0	0	0	0	0	3	0	0	26
37	1	0	27	0	17	0	0	0	1	0	1	0	2	49
38	0	1	22	0	35	0	1	0	3	1	2	0	1	66
39	1	1	28	0	39	0	1	0	4	3	1	1	0	79
40	3	0	25	0	40	0	4	1	3	4	2	0	2	84
41	0	1	20	0	32	0	4	0	11	7	1	0	0	76
42	1	3	18	0	32	0	1	2	11	12	1	0	0	81
43	2	3	21	0	29	0	3	5	20	22	3	0	1	109
44	0	6	12	0	19	2	4	6	11	11	1	0	1	73
45	3	5	12	0	15	1	7	7	13	16	2	2	1	84
46	2	7	23	1	20	3	13	7	16	10	1	5	0	108
47	6	1	15	0	12	1	10	7	13	9	3	0	0	77
48	11	8	18	0	14	1	13	7	16	4	0	0	0	92
49	8	11	12	0	7	0	6	5	15	0	1	0	0	65

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length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Wide Bay	Shelikof Strait	Mitrofanina Island	Stepovak Bay	Unga Strait	Chignik Bay	Beaver Bay	Kuiuukta Bay	Nakalilok Bay	Chiginagak Bay	Total
50	6	12	5	0	10	1	5	8	9	3	0	3	0	62
51	16	14	7	0	6	0	8	8	10	1	1	2	0	73
52	6	13	6	0	7	1	9	5	9	1	1	1	0	59
53	4	10	5	0	8	2	5	8	12	2	2	1	0	59
54	3	5	2	0	6	0	4	3	7	0	3	1	0	34
55	2	9	2	0	3	0	5	6	9	0	2	0	0	38
56	5	9	4	0	5	1	5	4	9	0	4	0	0	46
57	3	9	1	0	3	1	2	5	1	0	4	1	0	30
58	2	7	1	1	2	1	2	7	7	0	2	0	0	32
59	1	10	1	1	5	0	0	4	1	0	2	0	0	25
60	0	9	3	0	3	0	0	2	4	0	1	0	0	22
61	0	7	1	0	1	0	1	2	1	0	2	2	0	17
62	0	4	1	1	1	1	0	3	2	0	2	0	0	15
63	3	1	0	0	0	0	0	2	3	0	1	0	1	11
64	1	5	1	0	0	0	0	1	0	0	1	0	0	9
65	1	10	0	1	0	0	0	1	1	0	0	0	0	14
66	2	3	0	0	0	0	0	1	1	0	0	0	0	7
67	1	3	0	0	0	0	0	0	1	0	1	0	0	6
68	0	4	0	0	1	0	0	0	0	0	0	0	0	5
69	0	3	1	0	1	0	0	0	0	0	0	0	0	5
70	0	2	1	0	0	0	0	0	0	0	0	0	0	3
71	0	1	0	0	0	0	0	0	0	0	0	0	0	1
72	2	2	0	0	0	0	0	0	0	0	0	0	0	4
73	0	1	1	0	0	0	0	0	0	0	0	0	0	2
74	0	1	0	0	0	0	0	0	0	0	0	0	0	1
77	0	1	0	0	0	0	0	0	0	0	0	0	0	1

Appendix B2.-Juvenile walleye pollock lengths from the 2004 Westward Region small-mesh trawl survey.

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Wide Bay	Shelikof Strait	Mitrofanina Island	Stepovak Bay	Unga Strait	Chignik Bay	Beaver Bay	Kuiu Bay	Nakalilik Bay	Chignik Bay	Total
6	0	0	0	0	0	0	0	0	1	0	0	0	0	1
7	0	0	2	0	2	0	0	0	0	0	6	1	1	12
8	0	0	9	2	30	8	15	3	32	0	15	8	2	124
9	10	24	79	8	227	22	54	13	71	12	44	28	12	604
10	64	151	122	63	431	32	76	7	116	7	30	57	23	1179
11	125	246	90	140	258	19	26	7	70	3	18	58	40	1100
12	119	158	39	89	69	2	8	4	25	2	0	25	21	561
13	49	34	6	8	10	2	0	2	3	1	1	4	2	122
14	20	13	1	0	1	0	0	0	0	0	0	0	0	35
15	5	1	0	0	0	0	0	0	0	0	0	0	0	6
16	2	0	0	0	0	0	0	0	0	0	1	0	0	3
17	0	0	0	0	1	0	0	0	0	0	0	0	0	1
18	0	0	0	0	4	0	0	0	0	0	0	1	0	5
19	0	0	0	0	1	0	0	0	0	0	0	0	0	1
20	0	0	0	0	2	0	0	0	0	0	0	0	0	2
21	0	0	0	2	1	0	0	0	0	0	0	0	0	3

Appendix B3.-Flathead sole lengths from the 2004 Westward Region small-mesh trawl survey.

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Wide Bay	Shelikof Strait	Mitrofanina Island	Stepovak Bay	Unga Strait	Chignik Bay	Beaver Bay	Kuiu Bay	Nakalilik Bay	Chignik Bay	Total
7	1	0	0	0	1	0	0	0	1	0	0	0	0	3
8	2	3	1	1	0	0	0	2	0	0	3	0	0	12
9	6	4	0	3	0	0	0	0	0	0	2	0	0	15
10	1	6	0	1	0	0	0	0	0	0	0	0	0	8
11	0	1	0	0	0	0	2	0	0	0	0	0	0	3
12	0	1	0	0	0	0	1	2	0	0	0	0	0	4
13	0	0	0	0	0	1	1	2	0	0	2	0	0	6
14	0	0	3	1	1	0	0	1	1	0	0	0	0	7
15	1	2	0	0	0	0	0	0	2	0	3	0	0	8
16	0	3	1	0	0	0	1	0	0	0	1	0	0	6
17	1	1	1	0	0	0	0	0	1	0	2	0	0	6
18	0	1	0	0	0	0	0	1	0	0	0	0	0	2
19	0	1	0	0	0	0	0	2	0	0	1	0	0	4
20	0	0	0	0	0	0	0	1	0	0	1	0	0	2
21	1	0	1	0	0	0	1	1	1	0	0	0	0	5
22	0	0	0	0	1	0	3	5	1	0	2	0	0	12
23	0	2	1	0	0	0	0	5	0	0	2	1	0	11
24	0	0	3	0	0	0	4	4	2	0	0	0	1	14
25	0	1	3	0	0	0	1	3	3	2	1	0	1	15
26	0	0	2	0	0	1	3	2	4	0	5	0	0	17
27	1	3	0	0	0	2	2	2	2	0	3	0	1	16
28	2	7	6	0	0	0	2	2	6	0	1	0	0	26
29	3	4	6	0	0	0	2	3	8	0	2	2	0	30
30	3	10	12	0	0	0	4	9	4	0	9	1	0	52
31	5	8	13	0	0	2	2	7	8	0	9	1	0	55
32	3	10	13	0	0	0	1	7	12	0	9	1	0	56
33	3	12	6	0	2	1	2	13	20	0	12	0	0	71
34	11	15	20	0	2	1	5	8	26	0	17	2	0	107
35	5	15	17	0	2	0	0	13	20	0	13	0	0	85
36	9	17	11	0	1	0	1	7	24	0	9	2	0	81
37	7	17	17	0	1	2	0	6	12	0	11	0	0	73
38	9	22	5	0	5	1	0	16	19	0	8	0	0	85
39	13	25	10	0	3	1	0	6	5	0	11	0	0	74
40	9	13	4	0	2	1	3	3	6	0	3	0	0	44
41	8	18	4	0	1	1	0	3	9	0	2	0	0	46
42	10	7	7	0	0	0	3	2	4	0	3	0	0	36
43	9	8	3	0	0	0	0	1	3	0	0	0	0	24
44	1	4	2	0	0	1	0	0	1	0	1	0	0	10
45	0	8	1	0	0	1	0	0	2	0	0	0	0	12
46	1	6	1	0	0	0	0	0	1	0	0	0	0	9
47	0	1	1	0	0	0	0	0	0	0	0	0	0	2
48	0	1	0	0	0	0	0	0	0	0	0	0	0	1
49	0	1	0	0	0	0	0	0	0	0	0	0	0	1

Appendix B4.-Pacific cod lengths from the 2004 Westward Region small-mesh trawl survey.

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Wide Bay	Shelikof Strait	Mitrofanina Island	Stepovak Bay	Unga Strait	Chignik Bay	Beaver Bay	Kuiu Bay	Nakalilik Bay	Chignik Bay	Total
8	0	0	0	0	0	0	0	0	1	0	0	0	0	1
10	0	0	0	1	0	0	0	0	0	0	0	0	0	1
11	0	1	0	2	0	0	0	0	0	0	0	0	0	3
12	1	0	0	1	0	0	0	0	0	0	0	0	0	2
14	0	0	0	0	1	0	0	0	0	0	0	0	0	1
16	0	0	0	0	1	0	0	0	0	0	0	0	0	1
17	1	0	0	0	0	0	0	0	0	0	0	0	0	1
32	0	0	0	1	0	0	0	0	0	0	0	0	0	1
44	0	0	0	0	0	0	0	0	0	1	0	0	0	1
45	0	1	0	0	0	0	0	0	0	0	0	0	0	1
46	0	0	0	0	0	0	0	1	0	0	0	0	0	1
48	0	2	0	0	0	0	0	0	0	0	0	0	0	2
50	0	1	0	0	0	0	0	0	0	1	0	0	0	2
51	0	1	0	0	0	0	0	0	0	0	0	0	0	1
52	1	0	0	0	0	0	0	0	0	0	0	0	0	1
54	0	1	0	1	0	0	0	0	0	1	0	0	0	3
55	0	1	0	0	0	0	0	1	0	0	0	0	0	2
56	0	2	0	0	0	0	0	2	1	0	0	0	0	5
57	1	1	0	0	0	0	0	0	0	0	2	0	0	4
58	0	4	0	0	0	0	0	0	1	0	0	0	0	5
59	1	4	0	0	0	0	0	1	0	0	1	0	0	7
60	0	3	1	1	1	0	0	2	1	0	1	0	1	11
61	0	6	1	2	1	0	0	3	0	0	2	1	0	16
62	0	7	1	1	2	0	0	0	2	1	3	1	0	18
63	2	7	3	1	1	0	1	2	0	0	2	1	1	21
64	1	4	1	1	0	0	0	1	0	0	3	0	1	12
65	3	6	0	1	2	0	0	0	1	0	0	0	1	14
66	2	4	2	0	0	0	0	1	1	0	3	0	0	13
67	4	2	0	0	3	0	0	1	1	0	0	0	0	11
68	0	1	2	0	1	0	0	0	1	0	2	0	0	7
69	3	3	2	2	2	0	0	0	1	0	1	0	0	14
70	2	7	1	0	0	0	0	0	0	0	0	1	0	11
71	1	4	0	0	0	0	0	2	0	0	0	0	0	7
72	0	5	1	0	1	0	0	0	0	0	0	0	0	7
73	3	5	0	0	2	0	0	1	0	0	2	0	0	13
74	1	3	1	1	0	0	0	1	0	0	0	0	0	7
75	0	3	0	0	0	0	0	0	0	0	0	0	0	3
76	1	1	2	0	1	0	0	0	0	1	0	0	0	6
77	0	0	0	0	0	0	0	1	0	0	0	1	0	2
78	2	1	0	0	0	0	0	1	0	0	0	0	0	4
79	1	3	1	0	0	0	0	0	0	0	0	0	0	5
80	0	1	0	0	0	0	0	0	0	0	0	0	0	1
81	0	1	1	0	0	0	0	0	0	0	0	0	0	2
82	0	1	0	0	0	0	0	0	0	0	0	1	0	2
83	0	1	0	0	0	0	0	0	0	0	0	0	0	1
86	0	1	0	0	0	0	0	0	0	0	0	0	0	1
87	0	1	0	0	0	0	0	0	0	0	0	0	0	1
88	0	1	0	0	0	0	0	0	0	0	0	0	0	1
95	0	1	0	0	0	0	0	0	0	0	0	0	0	1

Appendix B5.-Arrowtooth flounder lengths from the 2004 Westward Region small-mesh trawl survey.

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Wide Bay	Shelikof Strait	Mitrofanina Island	Stepovak Bay	Unga Strait	Chignik Bay	Beaver Bay	Kuiu Bay	Nakalilik Bay	Chignagak Bay	Total
6	1	1	0	0	1	0	1	0	0	0	0	0	0	4
7	1	8	0	0	3	0	2	0	0	0	0	0	0	14
8	3	10	0	0	3	0	2	0	0	0	0	0	0	18
9	2	4	0	0	1	0	2	0	0	0	0	0	0	9
10	0	0	0	0	3	0	0	0	0	0	0	0	0	3
11	0	1	0	0	0	0	0	0	0	0	0	0	0	1
14	0	2	0	0	0	0	0	0	0	0	0	0	0	2
15	0	1	0	0	0	0	0	1	0	0	0	0	0	2
16	0	0	0	0	0	0	0	0	1	0	0	0	0	1
17	0	1	0	0	0	0	0	0	0	0	0	0	0	1
18	0	2	0	0	0	0	0	0	0	0	0	0	0	2
19	0	4	0	0	1	0	0	0	0	0	0	0	0	5
20	1	0	0	0	0	0	0	0	0	0	0	0	0	1
21	0	1	1	0	0	0	0	0	1	0	0	0	0	3
22	0	0	1	0	0	0	0	0	0	0	0	0	0	1
23	0	1	0	0	0	0	0	0	0	0	0	0	0	1
24	1	0	1	0	0	0	0	0	3	0	0	0	0	5
25	0	1	2	0	0	0	0	0	0	0	0	0	0	3
26	0	4	0	0	0	0	0	0	1	0	1	0	0	6
27	1	4	0	0	0	0	0	1	1	0	0	0	0	7
28	0	1	0	0	1	0	0	0	1	0	0	0	0	3
29	0	1	0	0	3	1	0	1	2	0	0	0	0	8
30	1	4	1	0	2	0	0	0	4	0	2	0	0	14
31	2	0	0	0	2	1	0	0	6	0	0	0	0	11
32	2	4	1	0	0	0	0	0	3	0	1	0	0	11
33	2	4	0	0	1	2	0	1	4	0	1	0	0	15
34	2	1	1	0	4	1	0	0	6	0	1	0	0	16
35	1	1	2	0	7	1	0	0	1	0	1	0	2	16
36	2	1	0	0	6	0	0	2	2	0	2	0	0	15
37	4	2	0	0	5	2	0	2	6	0	5	0	0	26
38	3	0	0	0	3	1	0	0	8	0	4	0	0	19
39	6	3	1	0	4	0	0	1	8	0	4	0	0	27
40	3	2	2	0	3	0	1	0	4	0	2	0	0	17
41	0	0	1	0	7	0	0	0	9	0	1	0	0	18
42	1	3	0	0	1	0	0	1	7	0	3	0	0	16
43	4	2	1	0	2	1	0	0	2	0	1	0	0	13
44	2	3	2	0	4	0	0	3	4	0	0	0	1	19
45	5	0	1	0	4	0	0	1	2	0	3	0	0	16
46	3	3	0	0	4	0	0	2	3	0	1	0	0	16
47	3	2	2	0	5	0	1	1	1	0	1	0	0	16
48	1	2	0	0	5	0	0	2	0	0	3	0	0	13
49	2	5	0	0	1	0	0	1	2	0	0	0	0	11
50	1	0	0	0	2	0	1	4	0	0	2	0	0	10

-continued-

Appendix B5. Page 2 of 2.

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Wide Bay	Shelikof Strait	Mitrofanina Island	Stepovak Bay	Unga Strait	Chignik Bay	Beaver Bay	Kuiuikta Bay	Nakalilok Bay	Chiginagak Bay	Total
51	0	0	0	0	5	1	0	1	2	0	0	0	0	9
52	1	2	1	0	2	0	1	2	0	0	2	0	0	11
53	0	4	2	0	3	0	0	0	0	0	0	0	0	9
54	0	4	0	0	1	0	0	1	1	0	0	0	0	7
55	0	2	0	0	5	0	0	1	1	0	1	0	0	10
56	0	6	1	0	6	0	0	0	2	0	1	0	0	16
57	0	4	1	0	8	0	0	3	1	0	1	1	0	19
58	1	2	1	0	4	0	0	2	0	0	1	0	1	12
59	2	3	1	0	5	0	0	0	2	0	3	0	0	16
60	1	1	1	0	5	0	0	1	2	0	0	0	0	11
61	0	1	0	0	2	0	0	1	0	0	0	0	0	4
62	0	3	1	0	1	0	0	0	0	0	1	0	0	6
63	0	0	0	0	2	0	0	2	0	0	0	0	0	4
64	3	0	0	0	1	0	0	0	2	0	0	0	0	6
65	1	1	1	0	0	0	0	0	1	0	0	0	0	4
66	1	0	2	0	0	0	0	1	1	0	0	0	0	5
67	0	0	0	0	2	0	0	0	0	0	0	0	0	2
68	0	0	0	0	1	0	0	0	2	0	0	0	0	3
69	0	0	0	0	0	0	0	0	1	0	0	0	0	1
70	0	0	0	0	0	0	0	1	0	0	0	0	0	1
71	0	0	2	0	0	0	0	0	0	0	0	0	0	2
72	0	0	1	0	2	0	0	0	0	0	0	0	0	3
73	0	0	0	0	1	0	0	0	0	0	0	0	0	1
74	0	0	0	0	0	0	0	0	1	0	0	0	0	1
76	0	0	0	0	0	0	1	0	0	0	0	0	0	1
82	0	0	0	0	0	0	0	1	0	0	0	0	0	1
84	0	0	0	0	0	0	0	0	1	0	0	0	0	1

Appendix B6.-Eulachon lengths from the 2004 Westward Region small-mesh trawl survey.

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Wide Bay	Shelikof Strait	Mitrofanina Island	Stepovak Bay	Unga Strait	Chignik Bay	Beaver Bay	Kuiuikta Bay	Nakalilok Bay	Chiginagak Bay	Total
8	0	0	0	0	0	0	1	0	6	0	12	0	0	19
9	0	0	0	0	3	3	4	0	15	0	26	1	0	52
10	0	3	0	0	1	5	17	0	29	0	13	2	0	70
11	1	2	0	0	0	6	3	1	15	0	1	0	0	29
12	0	2	1	0	2	5	9	4	5	0	2	1	0	31
13	0	0	0	0	1	14	35	7	11	0	1	2	0	71
14	0	13	3	0	5	37	36	16	26	0	5	6	0	147
15	10	38	12	0	3	27	52	26	39	0	12	16	0	235
16	27	51	10	0	5	20	44	28	47	0	9	17	1	259
17	39	41	16	0	14	17	43	48	57	0	11	12	1	299
18	69	64	24	0	9	25	52	98	64	0	12	20	10	447
19	74	99	27	0	26	16	22	98	68	0	23	21	16	490
20	51	46	5	0	35	10	12	65	44	0	29	24	40	361
21	13	22	1	0	84	2	1	23	23	0	24	5	20	218
22	7	14	0	0	71	0	0	8	5	0	5	2	16	128
23	0	7	0	0	29	0	0	0	0	0	1	0	2	39
24	0	2	0	0	1	0	0	0	0	0	0	0	0	3
26	0	0	0	0	1	0	0	0	0	0	0	0	0	1

Appendix B7.-Spiny dogfish lengths from the 2004 Westward Region small-mesh trawl survey.

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Wide Bay	Shelikof Strait	Mitrofanina Island	Stepovak Bay	Unga Strait	Chignik Bay	Beaver Bay	Kuiu Bay	Nakallik Bay	Chignik Bay	Total
58	0	1	0	0	0	0	0	0	0	0	0	0	0	1
62	0	1	0	0	0	0	0	0	0	0	0	0	0	1
64	1	2	0	0	0	0	0	0	0	0	0	0	0	3
65	1	0	1	0	0	0	0	0	0	0	0	0	0	2
66	1	1	0	0	0	0	0	0	0	0	0	0	0	2
67	0	1	0	0	1	0	0	0	0	0	0	0	0	2
68	1	2	0	0	1	0	0	0	0	0	0	1	0	5
69	3	0	0	0	0	0	0	0	1	0	0	0	0	4
70	1	3	0	0	1	0	0	0	0	0	0	0	0	5
71	0	1	2	0	1	0	0	0	0	0	0	0	0	4
72	3	5	1	0	2	0	0	0	1	0	0	0	0	12
73	2	3	2	0	3	0	0	0	0	0	0	0	0	10
74	2	4	1	0	1	0	0	0	0	0	0	0	0	8
75	0	5	2	0	2	0	0	0	0	0	0	0	0	9
76	1	4	0	0	2	0	0	0	1	0	0	0	0	8
77	3	5	0	0	1	0	0	0	0	0	0	0	0	9
78	4	2	0	0	2	0	0	0	0	0	0	0	0	8
79	3	4	1	0	4	0	0	0	2	1	0	0	0	15
80	3	2	0	0	2	0	0	0	1	0	0	1	0	9
81	1	1	0	0	3	0	0	0	0	0	0	0	0	5
82	0	2	1	1	0	0	0	0	0	0	0	0	0	4
83	1	1	0	0	0	0	0	0	1	0	0	0	0	3
84	1	1	1	1	0	0	0	0	2	0	0	0	1	7
85	0	2	0	0	1	0	0	0	0	0	0	0	0	3
86	0	3	0	0	3	0	0	0	0	0	0	1	0	7
87	0	2	0	0	2	0	0	0	0	0	0	0	0	4
88	1	2	0	0	1	0	0	0	0	0	0	0	0	4
89	0	0	0	0	2	0	0	0	0	0	0	0	0	2
90	0	0	1	0	1	0	0	0	0	0	0	0	1	3
91	0	0	0	0	1	0	0	0	0	0	0	0	0	1
92	0	0	1	0	0	0	0	0	0	0	0	0	0	1
95	0	0	0	0	0	0	0	0	1	0	0	0	1	2